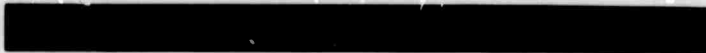


AD 677543

1



Distribution of this document
is unlimited.



CONVAIR (ASTRONAUTICS) DIVISION
GENERAL DYNAMICS CORPORATION

This document has been approved
for public release and sale; its
distribution is unlimited.

DDC
NOV 20 1968



CONVAIR | ASTRONAUTICS FORM A2136-1 (9-60) AS

Reproduced by the
CLEARINGHOUSE
for Federal Scientific & Technical
Information Springfield Va. 22151

DISCLAIMER NOTICE

THIS DOCUMENT IS THE BEST
QUALITY AVAILABLE.

COPY FURNISHED CONTAINED
A SIGNIFICANT NUMBER OF
PAGES WHICH DO NOT
REPRODUCE LEGIBLY.

AD 677543

4 DA.
REPORT NO. AE61-0661
DATE 12 July 1961
NO. OF PAGES 18

CONVAIR | ASTRONAUTICS

CONVAIR DIVISION OF GENERAL DYNAMICS CORPORATION

REDUCTION OF MASS SPECTROMETER DATA
FROM THE
AEDC (PWT) ROCKET PLANE EXPERIMENTS

Distribution of this document
is unlimited.



PREPARED BY

F. P. Boynton

APPROVED BY

J. T. Ngu

CHECKED BY

APPROVED BY

V. A. Nabits

NOV 20 1963

This document has been approved
for public release and sale; its
distribution is unlimited

This report has been prepared for General Dynamics/Convair under Contract
No. AF 04(647) 644 ARPA Order No. 153-60

REVISIONS

| NO. | DATE | BY | CHANGE | PAGES AFFECTED |
|-----|------|----|--------|----------------|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

TABLE OF CONTENTS

| | <u>Page</u> |
|---|-------------|
| TABLE OF CONTENTS. | i |
| ABSTRACT. | ii |
| I. INTRODUCTION. | 1 |
| II. ANALYSIS. | 6 |
| III. CONCLUSIONS. | 14 |
| Appendix | |
| a) Block Diagram, Calibration & Analysis Programs | 16 - 19 |
| b) Sample Calculations. | 20 - 23 |
| c) Computer Codes. | 24 - 45 |

LIST OF TABLES

| | |
|--------------------------------------|----|
| I. PEAK SELECTION PROCEDURE. | 4 |
| II. ASSIGNMENT OF Q-NUMBERS. | 5 |
| III. NOMENCLATURE. | 15 |

ABSTRACT

Gas sampling and mass spectrometric analysis are to be used to determine the composition of KI-1/O₂ and H₂/O₂ rocket plumes at various locations downstream of the nozzle exit. The exhaust gases will be analyzed for the constituents H₂, He, H₂O, N₂, CO, O₂, Ar, and CO₂. The mass spectrometer output is to be digitized and reduced by computational methods presented in this report. From the mass spectrometer output voltages one may determine the sample composition in terms of mole fractions, the mass fraction of entrained air, and the mixture ratio of the rocket. Computer codes for the IBM 650, together with block-diagrams and sample calculations, have been included as an appendix.

I. Introduction:

General Dynamics will conduct a study of the high-altitude behavior of rocket plumes in the Propulsion Wind Tunnel at Arnold Engineering and Development Center, Tullahoma, Tenn. One of the parts of the study is the sampling and analysis of the exhaust gases at various locations. A Consolidated Electrodynamics Corporation mass spectrometer, Model 21-620A, will be used to continuously monitor the exhaust gases. The output from this instrument will be digitized on punched tape and reduced by computer within a short period after the test has been conducted. This report represents methods of data reduction and block-diagrams of the necessary computer programs.

We presume the reader is familiar with the operation of a mass spectrometer, and we will not present the operating principles here. The particular instrument which will be used at AEDC has been modified so that mass-to-charge ratios from 2 to 10 appear on a single repeller setting. A low-pressure inlet system admits a heated gas sample to the system at about 0.05 psia collection pressure. Two peak selectors (Model 153250) have been ganged together to permit automatic stepping between a maximum of 12 different mass/charge ratios. Because the accelerating voltage takes some time to decay to a new value when the position of the selector switch is changed, it has been found necessary to interpose one or two "extra" settings between mass numbers which are far apart in terms of required voltage settings.

Essentially five different types of analyses are to be performed: background check, calibration, oxygen feed, RP-1/O₂ plume, and H₂/O₂

plume. The RP-1/O₂ plume will be analyzed for H₂, He, H₂O, N₂, CO, O₂, Ar, and CO₂ with the peak selector channels assigned as shown in Procedure A, Table I. Background checks (run at the beginning of each day, and before every 30-minute run) and oxygen feed analyses will also be conducted under this procedure when an RP-1/O₂ firing is being conducted. All calibrations will also be performed under this procedure. The H₂/O₂ plume will be analyzed for H₂, He, H₂O, N₂, O₂, and Ar according to Procedure B, since about 20 seconds per sample can be saved in this fashion. Backgrounds and O₂ feed analyses will be run according to Procedure B if H₂/O₂ firings are scheduled. Propellant oxygen will be analyzed for He, O₂, N₂, and Ar.

The data to be taken from each sample in order to perform a complete analysis, consist of the following items:

- 1) A tag number, Q, which identifies the sample being taken. Values of Q required range from zero to nine (0 - 9) and are shown in Table II.
- 2) The peak being analyzed. There are 12 peaks in all, their positions are preset by potentiometers on the peak selector chassis. Probably the best way to monitor the peak selector output is to pick up the position of the stepping switch. This might conveniently be taken off at the pilot lamp which indicates the energized channel to the operator.
- 3) The base line for each peak, or zero (Zi)
- 4) The maximum output at each peak (Hi)
- 5) An attenuation factor (Ai) for each peak; this is the factor by

which the output has been divided in order to keep it in the 0 - 10 mv. range. (This is done by means of series resistances). These data must be operated upon in order to express the composition of the sampled gases in mole fractions. This data reduction is to be done by means of a digital computer which will use the digitized mass spectrometer output as input.

Two machine programs will be required. One program calculates the sensitivity of the instrument to the different gases relative to the mass 28 peak of N_2 , which is arbitrarily set at 100. In the following discussion, we shall identify the sensitivity of the instrument to the j^{th} gas (where the identifying subscript j is assigned as shown in Table I) at the i^{th} mass number or peak selector channel as S_{ij} . The second program uses the S_{ij} 's and the output from the mass spectrometer caused by the sampled gases to calculate the mole fractions x_j of the constituents of the sample, the weight fraction R of entrained air determined from all the constituents, the weight fraction of air A determined from an argon-helium balance, the mixture ratio M_c of the rocket as determined from the sampled gases, and the carbon/hydrogen ratio D of the sample. This report includes block-diagrams, SOAP codes for the IBM 650, and complete hand-checks of the programs using representative inputs.

TABLE I: PEAK SELECTION PROCEDURES

| Channel | Procedure A | | | Procedure B | | |
|---------|---------------|--------------------------------------|-----------|---------------|------------------|-----------|
| | Approx. Volts | Gas | Mass Peak | Approx. Volts | Gas | Mass Peak |
| 1 | 160 | — | — | 160 | — | — |
| 2 | 156 | H ₂ | 2 | 156 | H ₂ | 2 |
| 3 | 80 | — | — | 80 | — | — |
| 4 | 76 | He | 4 | 76 | He | 4 |
| 5 | 26 | — | — | 20 | — | — |
| 6 | 24.5 | N ₂ , CO | 14 | 19 | H ₂ O | 18 |
| 7 | 19 | H ₂ O | 18 | 13 | — | — |
| 8 | 13 | — | — | 12.5 | N ₂ | 26 |
| 9 | 12.5 | N ₂ , CO, CO ₂ | 28 | 11.5 | O ₂ | 32 |
| 10 | 11.5 | O ₂ | 32 | 10 | Ar | 40 |
| 11 | 10 | Ar | 40 | 160 | — | — |
| 12 | 9 | CO ₂ | 44 | 160 | — | — |

TABLE II: ASSIGNMENT OF Q-NUMBERS

| <u>Q</u> | <u>Calibration</u> | <u>Analysis</u> | |
|----------|--------------------|---------------------|---------------------|
| | | <u>Procedure A</u> | <u>Procedure B</u> |
| 0 | Background | Background | Background |
| 1 | Air | O ₂ feed | _____ |
| 2 | N ₂ | Plume | _____ |
| 3 | O ₂ | _____ | O ₂ feed |
| 4 | Ar | _____ | Plume |
| 5 | CO | _____ | _____ |
| 6 | CO ₂ | _____ | _____ |
| 7 | H ₂ | _____ | _____ |
| 8 | He | _____ | _____ |
| 9 | H ₂ O | _____ | _____ |

II. Analysis:

The instrument will be calibrated once each day, or oftener if it appears necessary, by admitting a sample of pure gas to the auxiliary inlet at exactly atmospheric pressure, expanding it to the expansion volume, and introducing it into the mass spectrometer in "batch" fashion. The mass spectrometer is sensitive to the partial pressure of a particular gas at its inlet. Since we are analyzing all gases, we do not need the absolute sensitivity of each gas in volts output per pressure unit, but only the relative sensitivity. We shall arbitrarily designate the sensitivity S_{ij} of N_2 at mass 28 as 100, and refer others to it. This is allowable if the calibrating gases are all introduced at the same pressure into the inlet system.

It is conceivable that we may introduce some air into the instrument together with the calibrating gas. We can correct for an air impurity if the first calibrating gas which we run each day is air. The mole fraction of air is then easily determined by monitoring either the mass 28 or mass 32 peak choosing whichever does not occur in the mass spectrum of the pure gas. If the pure gas peak whose sensitivity we are measuring does not occur in air (i.e., does not happen to be 14, 28, 32, or 40), then the sensitivity of the pure gas is determined by dividing its apparent sensitivity (measured with the air contamination present) by its mole fraction, which is one less the mole fraction of air if no other contaminants are assumed to be present. If the particular peak of interest is one which also occurs in air, the air contaminant must be

subtracted from the peak height in order to determine the true value.

As an instructive example, consider the calibration of the instrument for sensitivity to CO_2 (gas number, $j = 8$) at the mass 28 ($i = 9$) and 44 ($i = 12$) peaks. The amount of air is determined by monitoring the peak at mass 32 ($i = 10$); the sensitivity of the instrument to oxygen at this mass number has been previously determined. The instrument measures the output voltage or peak height (H_i), the zero line (Z_i), and the attenuation factor (A_i) at all twelve peaks; we choose to operate only on peaks number $i = 9, 10, 12$. The corrected peak height C_i is determined by subtracting the zero reading from the measured value and multiplying by the attenuation factor, thus:

$$C_i = A_i (H_i - Z_i)$$

The background reading, B_i , which was previously determined, is subtracted from C_i to give the true peak height T_i :

$$T_i = C_i - B_i$$

The mole fraction of oxygen in the sample may be determined by dividing the true output at peak 10 by the output of pure oxygen at the same peak (and at the same sampling pressure), or since we use nitrogen as our reference,

$$x_6 = T_{10} S_{9,4} / S_{10,6} P_9$$

In the above expression x_6 is the mole fraction of O_2 (gas number, $j = 6$), $S_{9,4}$ ($= 100$) is the instrument sensitivity to nitrogen (gas number, $j = 4$) at the mass 28 peak ($i = 9$), $S_{10,6}$ is the sensitivity to O_2 at mass 32 ($i = 10, j = 6$) and P_9 is the instrument's response to a pure nitrogen sample at mass 28 at the same pressure as the CO_2 sample. We may then

determine the instrument's response to CO_2 at mass 44 ($S_{12,8}$) by the relation

$$S_{12,8} = T_{12} S_{9,4} / P_9 (1 - x_6 / 0.2095)$$

where 0.2095 is the mole fraction of oxygen in air. The response observed at mass 28 is due to both N_2 and CO_2 . The response due to N_2 is

$$\frac{0.7808}{0.2095} x_6 P_9$$

where 0.7808 is the mole fraction of N_2 in air. Then

$$S_{9,8} = \frac{S_{9,4}}{P_9} \frac{T_9 - \frac{0.7808}{0.2095} x_6 P_9}{1 - x_6 / 0.2095}$$

The block diagram of the calibration program was constructed from these and similar considerations. A bit of study will show how the corrections for air were performed in other cases.

The output of the calibration runs will be used in the analysis of the oxygen feed and plume samples, together with the output data (H, A, and Z) from these runs. For every component except N_2 and CO, the response factor F_j is determined by a relation

$$F_j = T_i / S_{i,j}$$

N_2 and CO both have major peaks at mass 14 and mass 28. The situation at mass 28 is further complicated because CO_2 has a peak there also. The procedure adopted is to subtract out the CO_2 contribution to the mass 28 output, as follows:

$$T_9' = T_9 - F_8 S_{9,8} / S_{12,8}$$

Then we may solve the following simultaneous equations for F_4 and F_5 (response factors for N_2 and CO):

$$S_{9,5} F_5 + S_{9,4} F_4 = T_9$$

$$S_{6,5} F_5 + S_{6,4} F_4 = T_6$$

Since there is no CO or CO_2 in the H_2/O_2 samples, we can calculate all response factors in the same manner. Once we have all the F_j 's, we may calculate the mole fractions of the different components:

$$X_j = F_j / \sum_{j=1}^8 F_j$$

The oxygen feed samples and the plume samples using H_2/O_2 propellant do not contain either CO or CO_2 , so that we may revise our procedures slightly in order to conserve tunnel time. This is why the subscripts in the analysis program block-diagram under tag numbers 3 and 4 (O_2 feed and H_2/O_2 plume sample, respectively) do not always match up.

In the plume samples, there are a number of quantities of interest which may be derived from the composition in terms of mole fractions. One of these is the ratio of hydrogen atoms to carbon atoms in the sampled gas. In RP-1 this ratio is about 2.0; its deviation from this figure in the sampled gases is a measure of the sampling error, since neither H nor C is added to the gas by the oxygen feed or the entrained air. We can compute this ratio (D) simply by summing the hydrogen-containing compounds multiplied by the subscript of hydrogen in each compound, and dividing by the similar sum of the carbon-containing compounds, e.g.,

$$D = (2 X_{H_2O} + 2 X_{H_2}) / (X_{CO} + X_{CO_2}) = (2x_3 + 2x_1) / (x_5 + x_8)$$

This computation is of course not performed when H_2 is the fuel.

The weight fraction of entrained air may be computed in two ways: The first requires an accurate analysis of the sampled gas, in that the true proportions of all components must be known. Since nitrogen is nearly inert, its relative proportion in the sample is unchanged by any reactions in the gas or by the sampling process (if a true sample is taken). We may thus compute a "mole fraction" of air (not a true mole fraction, since in general some of the oxygen has reacted) by the relation

$$X_A = X_{N_2} / 0.7808 = X_4 / 0.7808$$

The "molecular weight" of air is 28.962; a molecular weight of the exhaust gases, N , may be calculated by the relation

$$N = \sum_{j=1}^m X_j M_j$$

where M is 6 in a H_2/O_2 firing and 8 in an RP-1/ O_2 firing. Then the weight fraction of air computed in this manner is

$$A = 28.962 X_4 / 0.7808 N$$

A second method of computing the weight fraction of air does not require an accurate analysis of the sampled gases, but does require an analysis of the oxygen feed. This method utilizes an inert gas tracer (He) added to the O_2 feed and another inert tracer (Ar) which is naturally present in air. The weight fraction of He in the O_2 sample is

$$w_{2,0} = 4.005 X_{2,0} / N_0$$

This quantity is calculated from the oxygen analysis at the beginning of each 30-minute run. There will also probably be some argon present in

the oxygen; the weight fraction of argon is, similarly,

$$W_{7,0} = 39.944 \ x_{4,0}/N_0$$

(These quantities may be corrected for an air leak). The weight ratio of helium to argon in the plume sample may easily be determined from the mole ratios:

$$(W_2/W_7)_p = 4.003 \ x_2/39.944 \ x_7$$

The weight fraction of argon in air is 0.01288. From these four quantities, $W_{2,0}$, $W_{7,0}$, $(W_2/W_7)_p$, and $W_{7, \text{air}} = .01288$, we may compute the fraction of air independently from any effects of reaction.

Let the mixture ratio (determined by measuring the propellant flow rates) of the rocket be M . Then, on the basis of one lb. of fuel, M lbs. of oxygen enters the chamber, and $M + 1$ lb. of exhaust gases are formed. The weight fraction of helium in the exhaust is

$$W_{2,E} = W_{2,0} \ M/(M+1)$$

and likewise for argon. Let B lbs. of air be mixed with the $M+1$ lbs. of exhaust to form $M+1+B$ lbs. of plume. The weight fraction of He in the plume is:

$$W_2 = W_{2,0} \ M/(M + 1 + B)$$

The weight fraction of argon is:

$$W_7 = \frac{W_{7,0} \ M + 0.01288 \ B}{M + 1 + B}$$

and the ratio is

$$W_7/W_2 = W_{7,0}/W_{2,0} + (B/M) 0.01288/W_{2,0}$$

$$\text{whence } (B/M) = \frac{w_7/w_2 - w_{7,o}/w_{2,o}}{0.01288/w_{2,o}}$$

The air/oxygen ratio B/M may be used to calculate the weight fraction of entrained air, R , as follows:

$$R = M (B/M) / [M + 1 + M (B/M)]$$

$$\text{whence } R = \frac{M (w_7/w_2 - w_{7,o}/w_{2,o}) w_{2,o}/0.01288}{1 + M + (w_7/w_2 - w_{7,o}/w_{2,o}) w_{2,o}/0.01288}$$

The mixture ratio may also be determined from a knowledge of the total composition. Let us call this quantity M_c , to distinguish it from the measured mixture ratio M . The weight of fuel in one mole of sampled plume gas is given by

$$w_F = 2.016 (X_1 + X_2) + 12.010 (X_5 + X_8)$$

(The second term is not present if an H_2/O_2 run is being analyzed). The weight of oxygen is

$$w_{ox} = 32.000 (\frac{1}{2} X_3 + \frac{1}{2} X_5 + X_6 + X_8)$$

Part of this comes from entrained air, so that the amount due only to the propellant feed is

$$w_{ox,o} = 32.000 (\frac{1}{2} X_3 + \frac{1}{2} X_5 + X_6 + X_8 - \frac{0.2095}{0.7808} X_4)$$

The mixture ratio is then

$$M_c = \frac{w_{ox,o}}{w_F} = \frac{32.000 (\frac{1}{2} X_3 + \frac{1}{2} X_5 + X_6 + X_8 - \frac{0.2095}{0.7808} X_4)}{2.016 (X_1 + X_2) + 12.010 (X_5 + X_8)}$$

An alternative expression may be developed by using the relationship

$X_1 + X_3 = X_5 + X_8$ if the H/C ratio of the fuel is 2. Then

$$H_c = \frac{32.000 (\frac{1}{2} X_3 + \frac{1}{2} X_5 + X_6 + X_8 - 0.2685 X_4)}{14.026 (X_5 + X_8)}$$

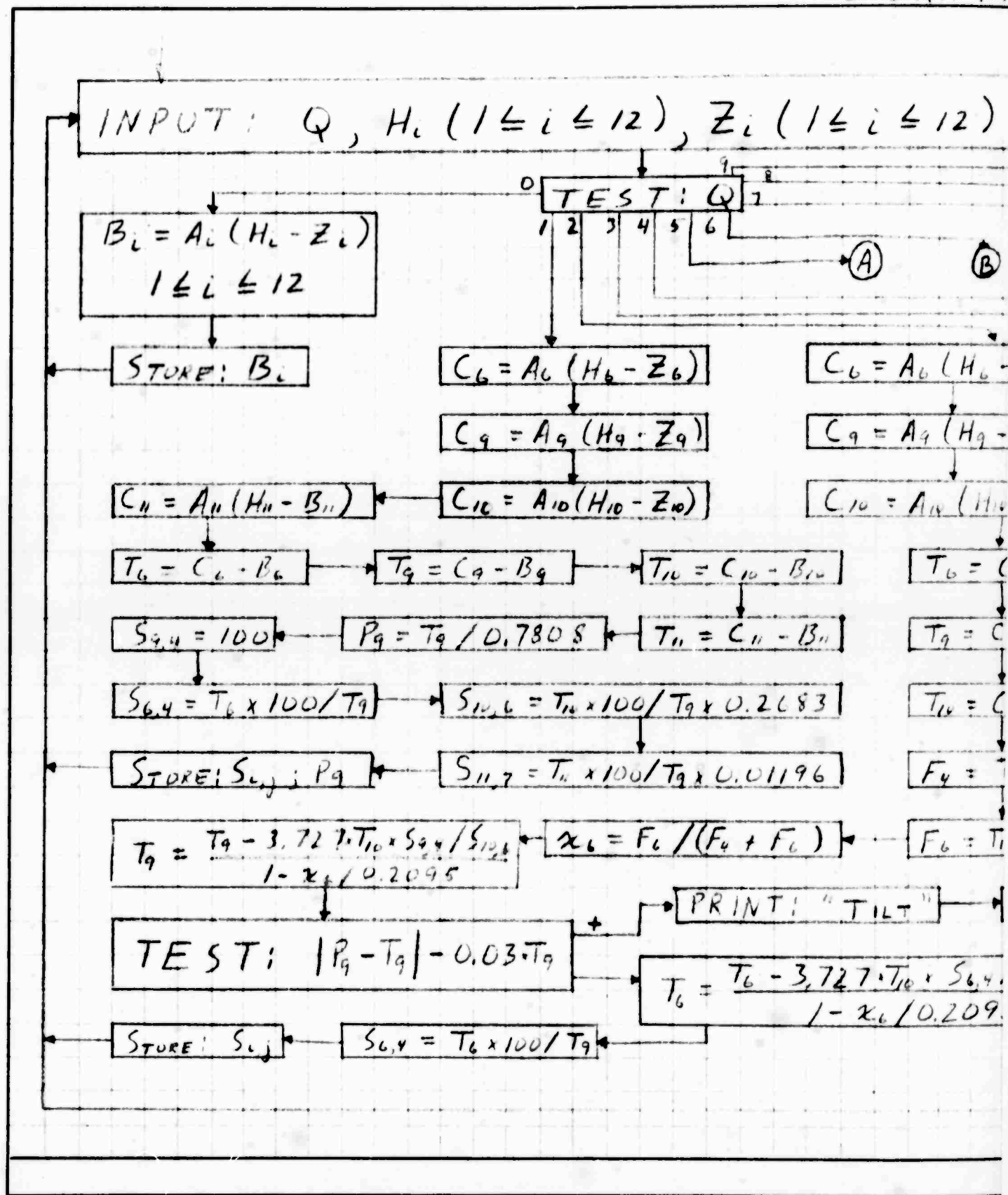
This last expression puts less reliance on the accuracy of the analysis of the condensable component H_2O ; it can only be used for the RP-1/ O_2 runs.

III. Conclusions:

On the basis of the considerations indicated in the preceding section, we have developed computer programs suitable for the reduction of digitized mass spectrometer output data. In the appendix, block-diagrams, SOAP codes suitable for the IBM 650, sample inputs, and hand-computed results are presented. These results may be used in incorporating these data reduction procedures into the AEDC system. The input required for calibrations are the individual peak heights, base lines, and attenuation factors, as well as tag numbers (0 - 9) which identify the different gases. The output of the calibration data reduction program consists of the relative sensitivities of the different constituents. The analysis of a gas sample requires the same type of input as the calibration runs, and also the sensitivities and a measured propellant mixture ratio. The output of this program is the mole fractions of the different gases in the sample, the H/C ratio of the fuel (if it is RP-1), the weight fraction of entrained air (computed in two ways), and the mixture ratio of the propellant as computed from the sample composition. This information can be used in a number of subsequent calculations; some of these will be discussed in another report.

TABLE III: NOMENCLATURE

| | |
|----------|--|
| A | Mass fraction of entrained air (from total composition) |
| A_i | Attenuation factor at i^{th} mass peak |
| B_i | Background peak height at i^{th} mass peak |
| C_i | Corrected peak height at i^{th} mass peak |
| D | Hydrogen/carbon ratio of fuel |
| F_j | Response factor due to the j^{th} component |
| H_i | Measured peak height at i^{th} mass peak |
| M | Measured mixture ratio of propellant |
| M_e | Calculated mixture ratio |
| N | Molecular weight of sampled gases |
| P_9 | Response of instrument to N_2 at mass 28 |
| Q | Tag number, identifying sample |
| R | Mass fraction of entrained air (from Ar/He balance) |
| S_{ij} | Sensitivity at i^{th} mass peak of j^{th} component, relative to $S_{28, N_2} = 100$ |
| T_i | True peak height at i^{th} mass peak |
| W_j | Weight fraction of j^{th} component in sample |
| X_j | Mole fraction of j^{th} component in sample |
| Z_i | Zero or base line at i^{th} mass peak |



A

16

F.D.N.

$$), A_c (1 \leq c \leq 12)$$

B **C** **D** **E**

(NEXT PAGE)

$$C_g = A_g (H_g - Z_g)$$

$$C_{10} = A_{10} (H_1 - Z_1)$$

$$T_q = C_q - B_q$$

$$T_{12} = C_{12} - B_{12}$$

$$C_9 = B_9 \quad F_9 = T_9 / 100$$

$$F_L = T_{10} / \sin \theta$$

$$x_4 = F_4 / (F_4 + F_6)$$

$$T_{10} = \frac{T_{10} - 0.2683 \times T_g \times S_{10.6} / 100}{1 - \alpha_g / 0.7808}$$

$$S_{10.6} = T_{10} \times 100 / P_9$$

95

STROKE: S₁

$$C_a = A_a (H_a - Z_a) - C_n = A_n (H_n - Z_n)$$

$$C_n = A_n (11.72)$$

$$T_H = C_H \cdot B, \quad T_L = C_L \cdot B_L$$

Ti - Li - Ba

$$F_9 = T_9 / 100 \quad \cdot \quad F_7 = T_{11} / S_{11,2}$$

$$F_7 = T_{11} / S_{11,27}$$

$$x_4 = F_4 / (F_3 + F_4 / 0.7805)$$

$$T_n = \frac{T_n - 0.01196 \cdot T_a + 511.7 / 100}{1 - 2.4 / 0.7805}$$

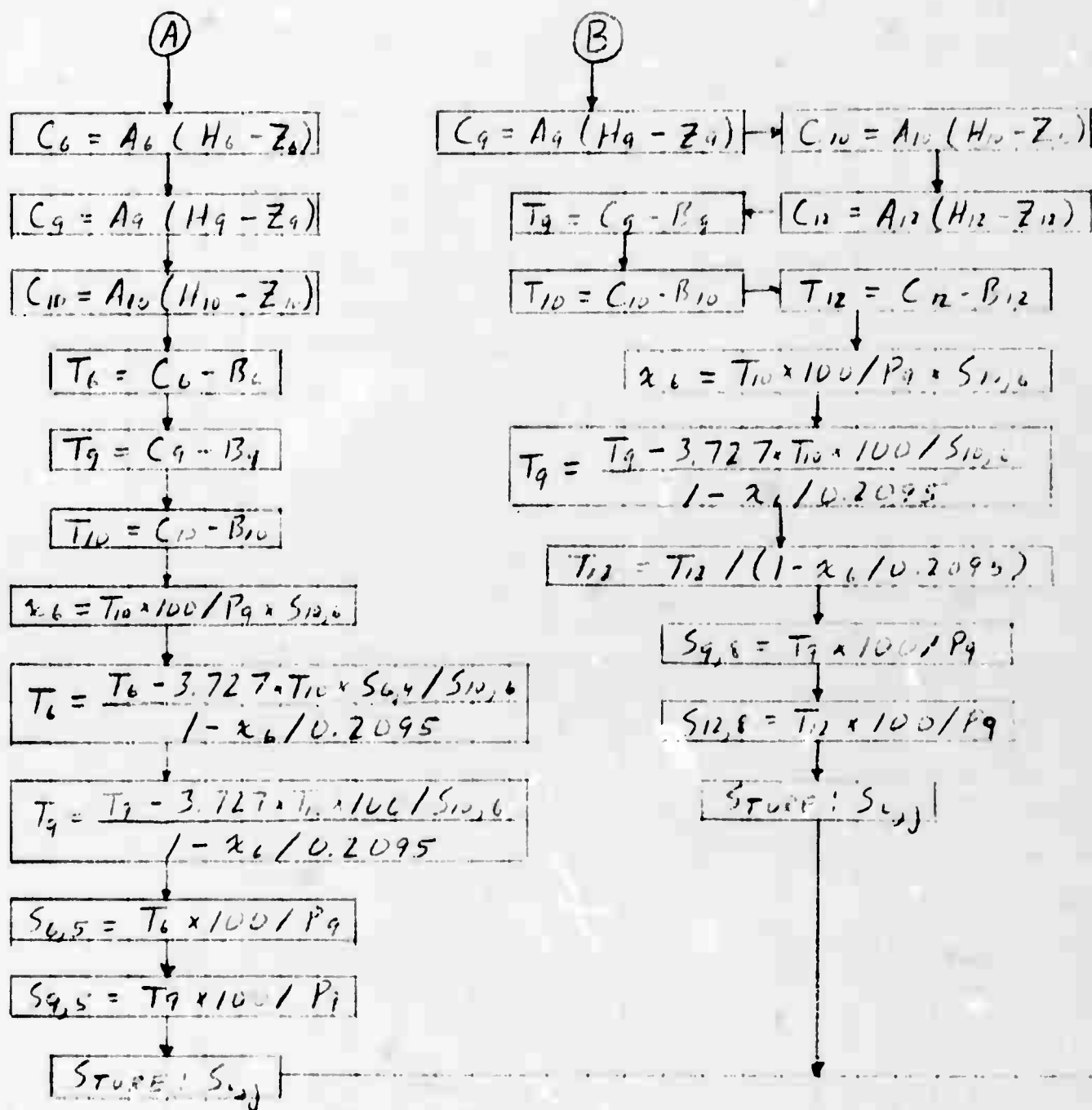
$$S_{H,7} = T_H \times 100 / P_H \quad S_{T,H} : S_{C,H}$$

ST. 11: 5.2

HALT

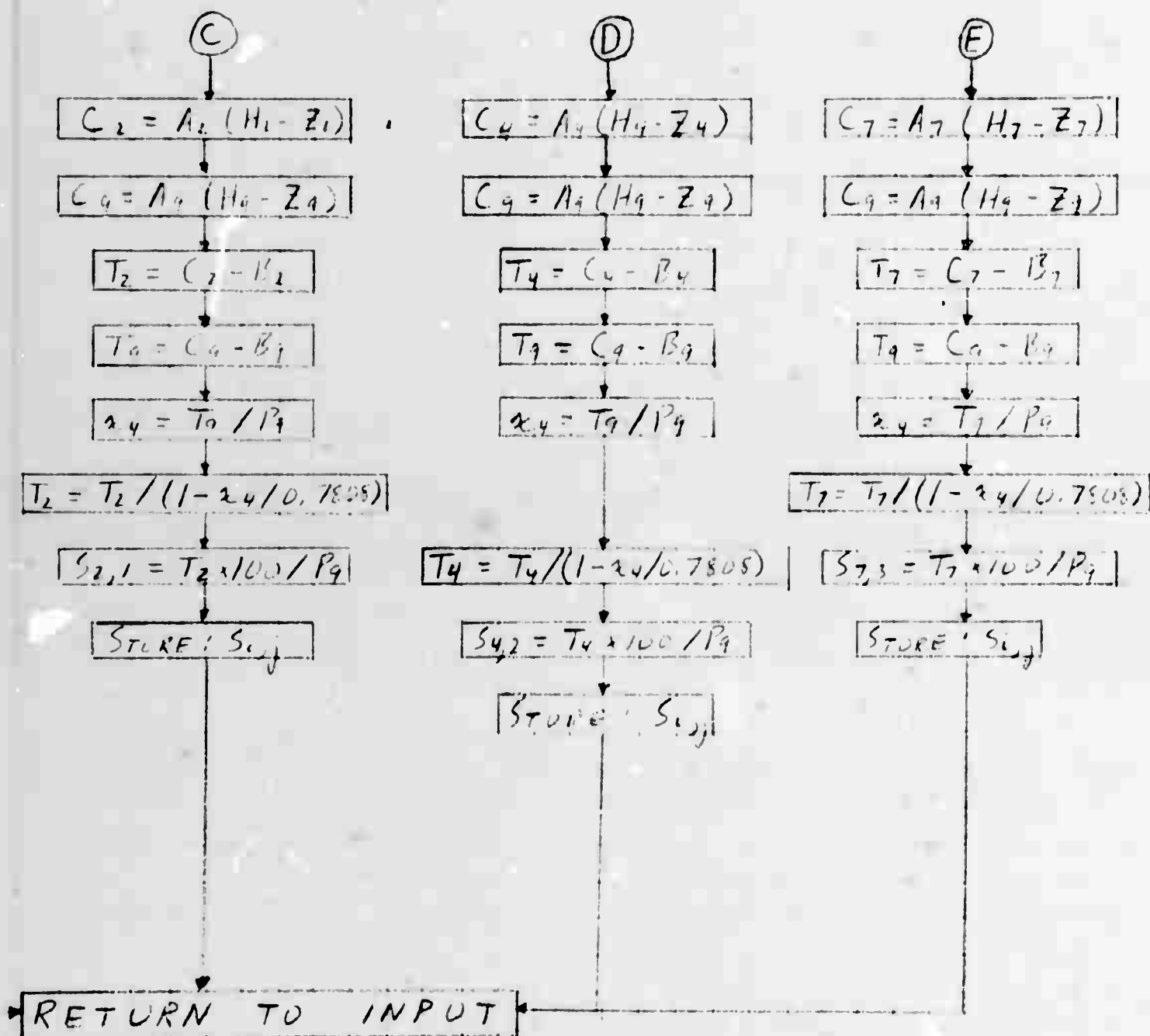
4/5.00
95

CALIBRATION



A

ON (CONT.)



PREPARED BY

DATE

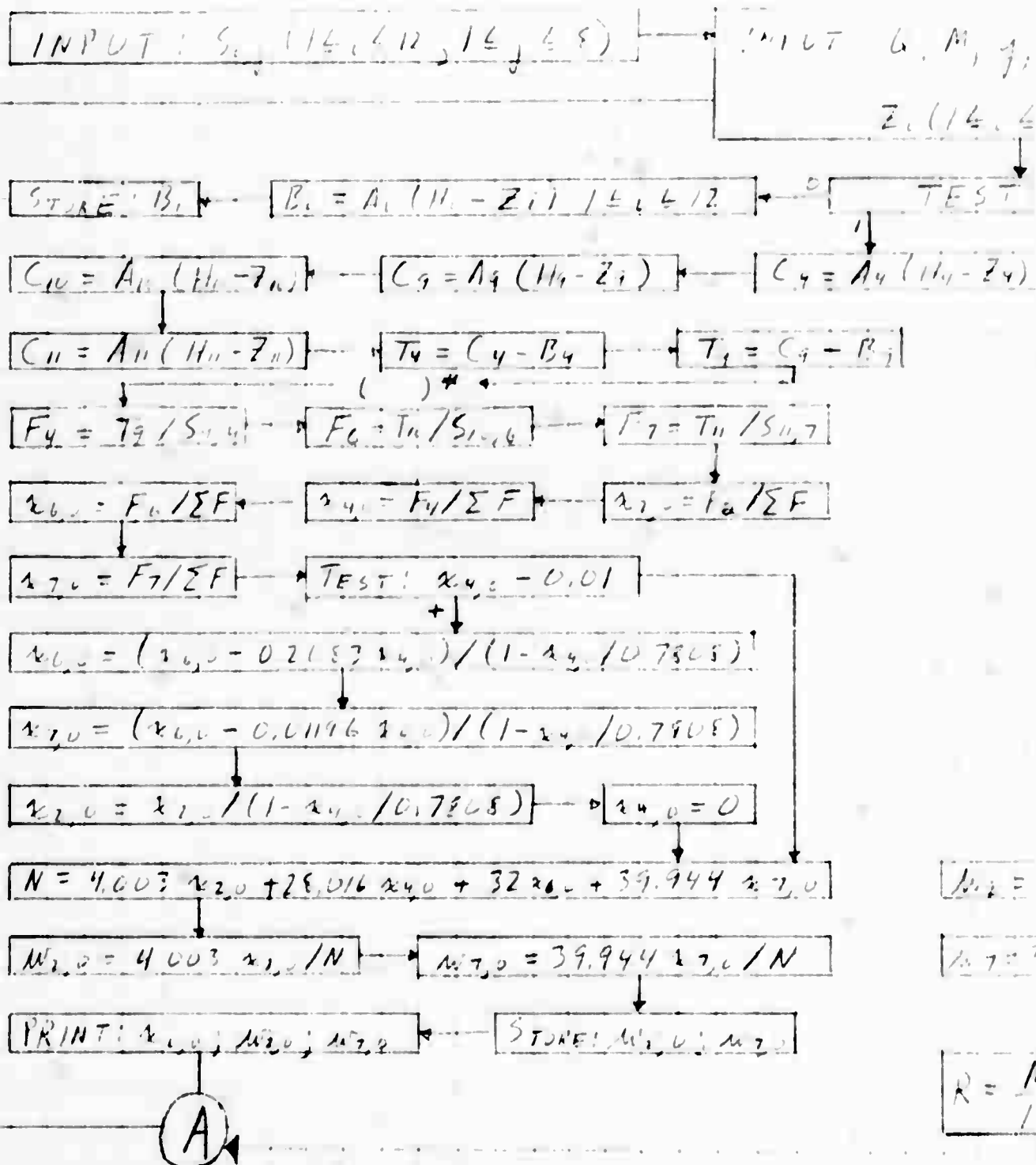
CHECKED BY

DATE

REVISED BY

DATE

B



$$N_{2,0} =$$

$$N_{7,0} =$$

$$R = \frac{1}{1}$$

$$*(T_{10} = C_{10} - B_{10} \rightarrow T_{11} = C_{11} - B_{11} \rightarrow F_2 = T_4 / S_{4,2})$$

A

TEXT NOT REPRODUCIBLE

REPORT AE 61-0661

PAGE 18

1515



PREPARED BY

DATE

CHECKED BY

DATE

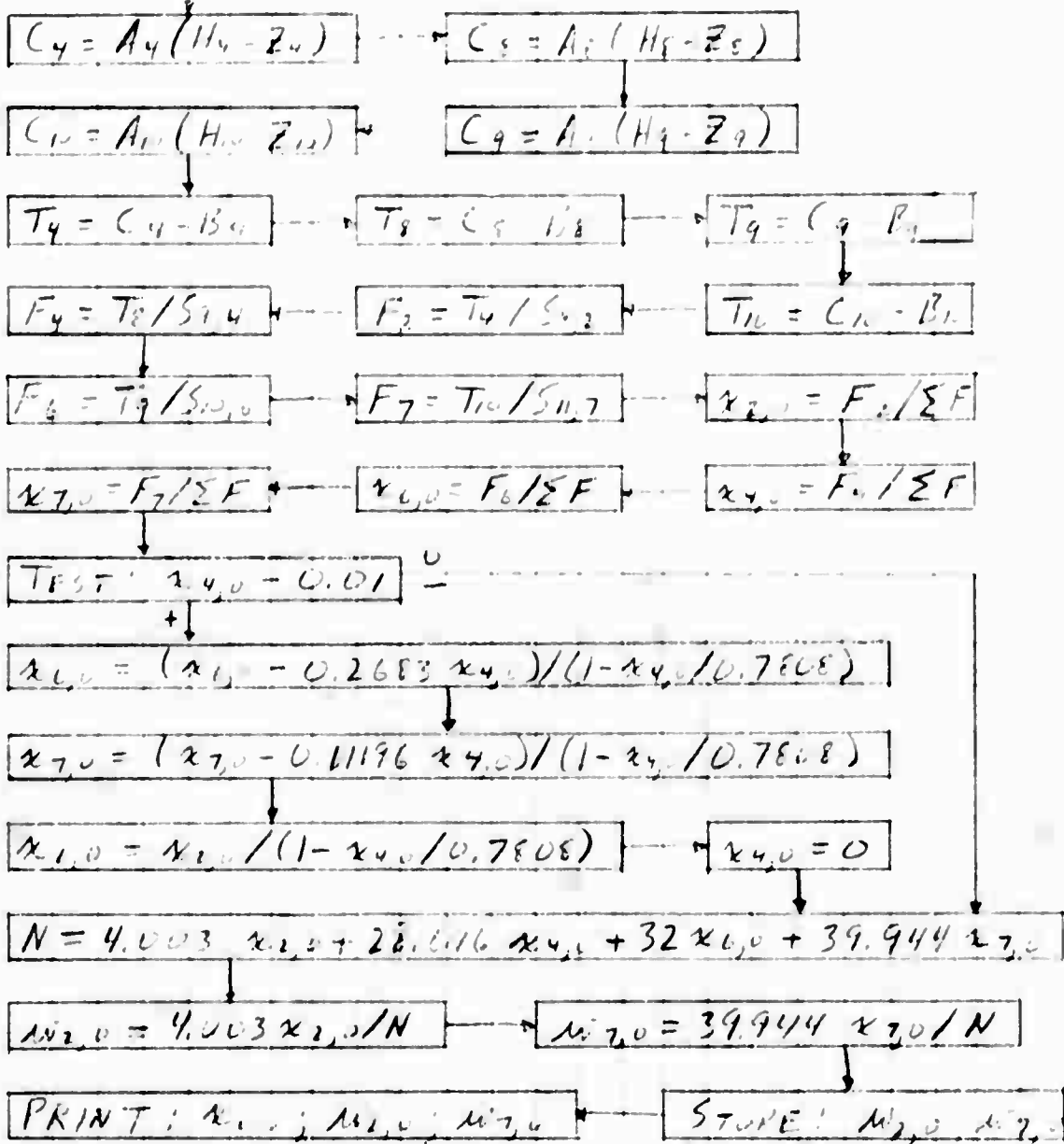
REVISED BY

DATE

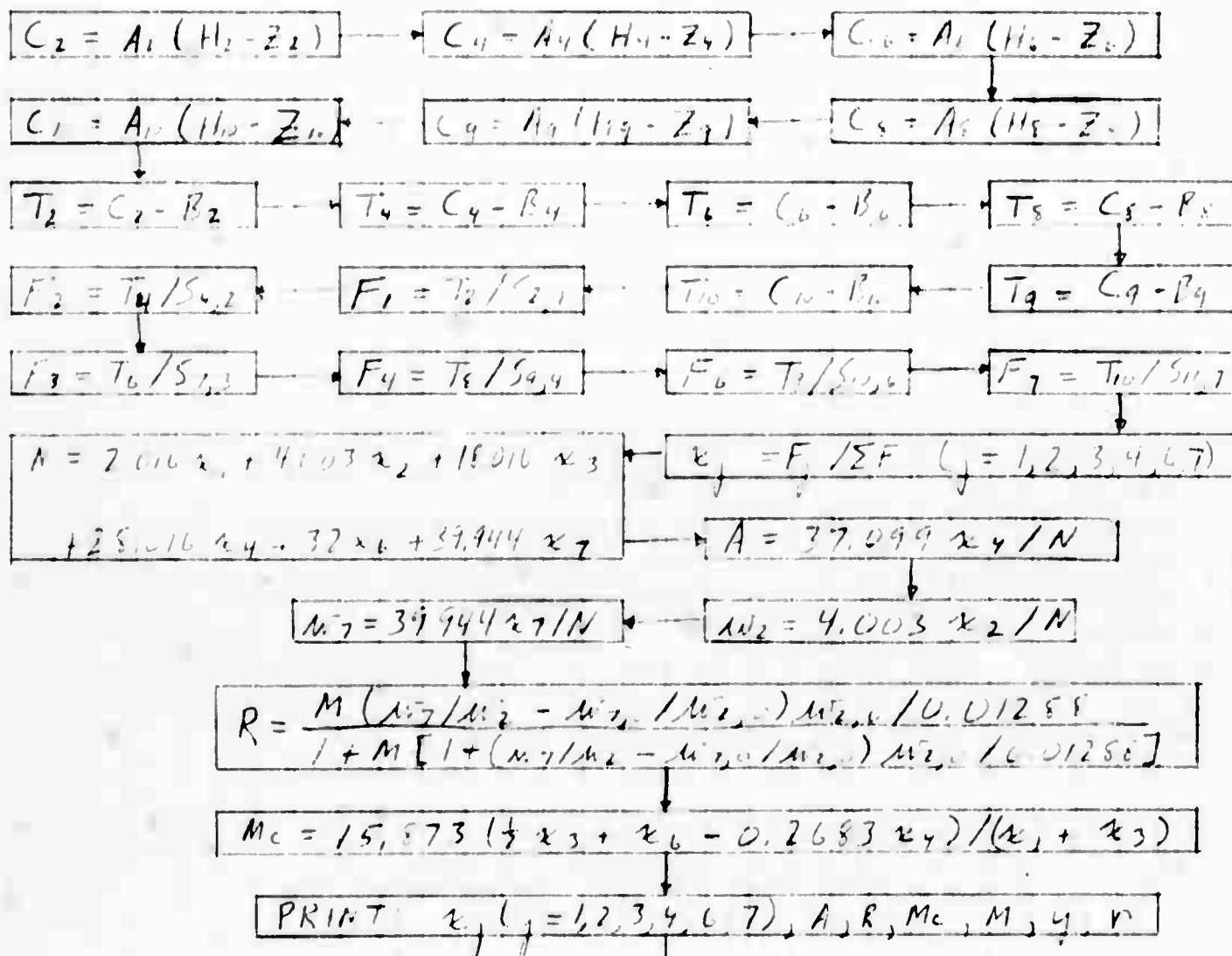
12

ANALYSIS (CONT)

(3)



TEXT NOT REPRODUCIBLE



SAMPLE INPUT (ANALYSIS)

| | | i=1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|------|------------|-----|-------|---|-------|----|--------|-------|----|
| INIT | $S_{ij}=1$ | | 39.36 | | | | | | |
| | 2 | | | | 16.70 | | | | |
| | 3 | | | | | | | 86.71 | |
| | 4 | | | | | | 7.224 | | |
| | 5 | | | | | | 0.2663 | | |
| | 6 | | | | | | | | |
| | 7 | | | | | | | | |
| | 8 | | | | | | | | |
| Q=0 | H | 10 | 15 | 4 | 7 | 10 | 20.5 | 36 | 1 |
| | A | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 1 |
| | Z | 10 | 10 | 4 | 6 | 10 | 10 | 10 | 10 |
| Q=1 | H | 4 | 15 | 4 | 29.4 | 10 | 20.5 | 36 | 1 |
| | A | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 1 |
| | Z | 4 | 10 | 4 | 6 | 10 | 10 | 10 | 10 |
| Q=2 | H | 10 | 48.5 | 4 | 18 | 10 | 77.5 | 54.3 | 10 |
| | A | 1 | 10 | 1 | 1 | 10 | 10 | 100 | 1 |
| | Z | 10 | 10 | 4 | 6 | 10 | 10 | 10 | 10 |
| Q=0 | H | 10 | 20 | 4 | 6 | 10 | 36 | 10 | 6 |
| | A | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 1 |
| | Z | 10 | 10 | 4 | 6 | 10 | 10 | 10 | 10 |
| Q=3 | H | 10 | 20 | 4 | 47.3 | 10 | 36 | 10 | 67 |
| | A | 1 | 1 | 1 | 3 | 1 | 3 | 1 | 3 |
| | Z | 10 | 10 | 4 | 9 | 10 | 10 | 10 | 10 |
| Q=4 | H | 10 | 76.1 | 4 | 47.3 | 10 | 47.6 | 10 | 99 |
| | A | 1 | 100 | 1 | 3 | 1 | 300 | 1 | 1 |
| | Z | 10 | 10 | 4 | 9 | 10 | 10 | 10 | 10 |

A

20

15

$Q = 0 \quad 1 \quad 2 \quad 0 \quad 3 \quad 4$

| | | | |
|---|-------|-------|-----|
| 8 | 1 = 1 | 0 | 0 |
| | 2 | 5 | 10 |
| | 3 | 0 | 0 |
| | 4 | 1 | 0 |
| | 5 | 0 | 0 |
| | 6 | 10.5 | 78 |
| | 7 | 78 | 0 |
| | 8 | 0 | 55 |
| | 9 | 133.5 | 5.4 |
| | 10 | 29 | 1 |
| | 11 | 6 | 0 |
| | 12 | 9 | 0 |

| | | | | | | |
|---|-----|--------|-------------------|-----|-------|--------|
| C | L=1 | | | | | |
| | 2 | | 385 | 385 | | 6610 |
| | 3 | | | | | |
| | 4 | 23.4 | 12 | | 114.9 | 114.9 |
| | 5 | | | | | |
| | 6 | | 675 | | | 11,280 |
| | 7 | | 4430 | | | |
| | 8 | | 12,000 | | 171.9 | 99.4 |
| | 9 | 167.5 | 12,000 | | 6020 | 64 |
| | 10 | 10,980 | 75 | | 15 | 6.4 |
| | 11 | 33 | 163.8 | | | |
| | 12 | | 3810 | | | |

| T | L | | | | |
|---|----|--------|------------------|-------|--------|
| | 1 | | | | |
| | 2 | | 380 | | 6600 |
| | 3 | | | | |
| | 4 | 22.4 | 11 | 114.9 | 114.9 |
| | 5 | | 114.5 | | |
| | 6 | | 664.5 | | 11,200 |
| | 7 | | 4352 | | |
| | 8 | | | 116.9 | 35.4 |
| | 9 | 26 | 11866 | 6015 | 59.6 |
| | 10 | 10,950 | 46 | 14 | 5.4 |
| | 11 | 27 | 157.8 | | |
| | 12 | | 3801 | | |

L A

11625

SAMPLE INPUT (CALIBRATION)

| | | | L = 1 | 2 | 3 | 4 | 5 |
|-------|---|--|-------|-----|---|-----|----|
| Q = 0 | H | | 10 | 15 | 4 | 7 | 10 |
| | A | | 1 | 1 | 1 | 1 | 1 |
| | Z | | 10 | 10 | 4 | 6 | 10 |
| Q = 1 | H | | 10 | 15 | 4 | 7 | 10 |
| | A | | 1 | 1 | 1 | 1 | 1 |
| | Z | | 10 | 10 | 4 | 6 | 10 |
| Q = 2 | H | | 10 | 15 | 4 | 7 | 10 |
| | A | | 1 | 1 | 1 | 1 | 1 |
| | Z | | 10 | 10 | 4 | 6 | 10 |
| Q = 3 | H | | 10 | 15 | 4 | 7 | 10 |
| | A | | 1 | 1 | 1 | 1 | 1 |
| | Z | | 10 | 10 | 4 | 6 | 10 |
| Q = 4 | H | | 10 | 15 | 4 | 7 | 10 |
| | A | | 1 | 1 | 1 | 1 | 1 |
| | Z | | 10 | 10 | 4 | 6 | 10 |
| Q = 5 | H | | 10 | 15 | 4 | 7 | 10 |
| | A | | 1 | 1 | 1 | 1 | 1 |
| | Z | | 10 | 10 | 4 | 6 | 10 |
| Q = 6 | H | | 10 | 15 | 4 | 7 | 10 |
| | A | | 1 | 1 | 1 | 1 | 1 |
| | Z | | 10 | 10 | 4 | 6 | 10 |
| Q = 7 | H | | 710 | 76 | 4 | 7 | 10 |
| | A | | 100 | 100 | 1 | 1 | 1 |
| | Z | | 110 | 10 | 4 | 6 | 10 |
| Q = 8 | H | | 10 | 15 | 4 | 39 | 10 |
| | A | | 1 | 1 | 1 | 100 | 1 |
| | Z | | 10 | 10 | 4 | 10 | 10 |
| Q = 9 | H | | 10 | 15 | 4 | 7 | 10 |
| | A | | 1 | 1 | 1 | 1 | 1 |
| | Z | | 10 | 10 | 4 | 6 | 10 |

A

v)

| 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|------|-----|----|-----------------|-----|------|-----|
| 19 | 36 | 10 | 55 | 36 | 16 | 17 |
| 1 | 3 | 1 | 3 | 1 | 1 | 1 |
| 10 | 10 | 10 | 10 | 10 | 13 | 11 |
| 42 | 38 | 10 | 54.3 | 40 | 82.3 | 22 |
| 30 | 3 | 1 | 300 | 100 | 3 | 11 |
| 10 | 10 | 10 | 10 | 10 | 11 | 11 |
| 51 | 36 | 10 | 66.5 | 58 | 17 | 17 |
| 30 | 3 | 1 | 300 | 1 | 1 | 1 |
| 10 | 10 | 10 | 10 | 10 | 13 | 11 |
| 26 | 36 | 10 | 82 | 53 | 18 | 17 |
| 1 | 3 | 1 | 3 | 300 | 1 | 1 |
| 10 | 10 | 10 | 10 | 10 | 13 | 11 |
| 26 | 36 | 10 | 82 | 46 | 78.7 | 17 |
| 1 | 3 | 1 | 3 | 1 | 300 | 1 |
| 10 | 10 | 10 | 10 | 10 | 10 | 11 |
| 66.7 | 36 | 10 | 64.8 | 44 | 16 | 17 |
| 1 | 3 | 1 | 300 | 1 | 1 | 1 |
| 10 | 10 | 10 | 10 | 10 | 13 | 11 |
| 20 | 36 | 10 | 24.1 | 48 | 16 | 74 |
| 1 | 3 | 1 | 100 | 1 | 1 | 300 |
| 10 | 10 | 10 | 10 | 10 | 13 | 10 |
| 26 | 36 | 10 | 15 | 4 | 10 | 10 |
| 1 | 3 | 1 | 1 | 1 | 1 | 1 |
| 10 | 10 | 10 | 10 | 4 | 13 | 10 |
| 26 | 36 | 10 | 82 | 46 | 18 | 17 |
| 1 | 3 | 1 | 3 | 1 | 1 | 1 |
| 10 | 10 | 10 | 10 | 10 | 13 | 11 |
| 19 | 59 | 10 | 55 | 36 | 16 | 17 |
| 1 | 300 | 1 | 3 | 1 | 1 | 1 |
| 10 | 10 | 10 | 10 | 10 | 13 | 11 |

SAMPLE CALCULATION (CALIBRATION)

Q=1

2

3

4

5

C₂

T₂

C₄

T₄

C₆

T₆

C₇

T₇

C₉

T₉

C₁₀

T₁₀

C₁₁

T₁₁

C₁₂

T₁₂

P₉

F₄

F₆

F₇

X₄

X₆

S_{2,1}

S_{4,2}

S_{6,4}

S_{6,5}

S_{7,3}

S_{9,4}

S_{9,5}

S_{9,8}

S_{10,6}

S_{11,7}

S_{12,8}

A

960

951

13,290

13,160

3,000

2,974

213.9

210.9

16,860

168.2

0.2612

7.226

0.00155

7.224

100.0

84.23

134.0

76.75

123.1

0.2

99.

44.

56.7

47.7

44.

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

34

8

20,610

20,607

20,750

16,440

16,300

AE61-0661
23

2N)

| | 6 | 7 | 8 | 9 | i | B _c | | |
|-------|----------------------------|--------------------|-----------|----------------|------------------|---|--|--|
| | | 6,600 6,595 | 6,636 | 2,800 2,799 | | 1 2 3 4 5 6 7 8 9 10 11 12 | 0 5 0 1 0 9 78 0 135 26 3 6 | |
| 4.89 | | | | 2,816 | | | | |
| | | | | | 14,700 14,620 | | | |
| 6,310 | 1,410 1,275 38 12 | 216 1,222 81 | 216 81 | | 135 0 | | | |
| | 19,200 19,190 | 19,270 | | | | | | |
| | .00092 | .00480 | .00480 | 0 | | | | |
| | | 39.36 | | 16.70 | | | | |
| 2663 | | | | 86.71 | | | | |
| 9.47 | 7,248 | | | | | | | |
| | 114.3 | | | | | | | |

B

```

1      SOAP CODE ANALYSIS
1      IBM 650 INPUT
1      Q 0 1 2 PART A      CELL LOCATION
1      Q 0 3 4 PART B
1      H I 1 1 12          0 1 TO 0012
1      Z I 1 1 12          0 13 TO 0024
1      A I 1 1 12          0 25 TO 0036
1      SIJ 2 1 9 1 J 8 0 57 TO 0064
1      M 1A OR M 1B        0 48
1      Y 1A OR Y 1B        0 49
1      LOWER CASE Y
1      R 1A OR R 1B        0 50
1      LOWER CASE R
1      IBM 650 OUTPUT ANALYSIS
1      Q 0 1 2 PART A      CELL LOCATION
1      Q 0 3 4 PART B
1      X I 1 1 1 8          0 77 TO 0084
1      PUNCH X
1      XIJ 2 1 7 J 0        0127 TO 0130
1      PUNCH P
1      WIJ 2 1 7 J 0        0177 TO 0179
1      PUNCH W
1      A      PUNCH W        0180
1      D      PUNCH W        0181
1      N      PUNCH W        0182
1      R      PUNCH W        0183
1      MC     PUNCH W        0184
1      LOWER CASE C
1      M      PUNCH L        0227
1      Y      PUNCH L        0228
1      LOWER CASE Y
1      R      PUNCH L        0229
1      LOWER CASE R
1      THIS PROGRAM USES IBM 650 7PER
1      CARD LOAD SUBROUTINE
1      END

```

| | | | | |
|----|-------|-------|---------|------------|
| 1 | BLR | 1000 | 1999 | |
| 2 | REG | H0001 | 0012 | READ |
| 3 | REG | Z0013 | 0024 | READ |
| 4 | REG | A0025 | 0036 | READ |
| 5 | REG | S0037 | 0050 | READ |
| 6 | REG | B0051 | 0062 | |
| 7 | REG | T0063 | 0074 | |
| 8 | REG | X0077 | 0086 | PUNCH XI |
| 9 | REG | P0127 | 0136 | PUNCH XIJ |
| 10 | REG | W0177 | 0186 | PUNCH W,MC |
| 11 | REG | L0227 | 0236 | PUNCH MYR |
| 12 | REG | R0327 | 0236 | |
| 13 | REG | F0100 | 0111 | |
| 14 | REG | C0112 | 0123 | |
| 15 | SYN | START | 1950 | |
| 16 | SYN | HALT | 0000 | |
| 17 | START | RSP | 0012 | LOOP2 |
| 18 | LOOP2 | RAU | H0013 R | |
| | | FSR | Z0013 R | |
| 20 | | FMP | A0013 R | |
| 21 | | STU | R0013 R | |
| 22 | | LDD | PETF | |

| | | | |
|------|----|------|------|
| 1950 | 83 | 0012 | 0156 |
| 0156 | 60 | 4013 | 0167 |
| 0167 | 33 | 4025 | 0151 |
| 0151 | 39 | 4037 | 0087 |
| 0087 | 21 | 4063 | 0166 |
| 0166 | 69 | 0169 | 0172 |

| | | | | | | | | | |
|----|-------|-----|---------|-------|-------|------|----|------|------|
| 23 | | STD | 1950 | | | 0172 | 24 | 1950 | 0153 |
| 24 | | AXR | 0001 | | | 0153 | 52 | 0001 | 0159 |
| 25 | | NZR | LOOP2 | 1961 | | 0159 | 42 | 0156 | 1961 |
| 26 | PETF | RSR | 0012 | RETR1 | | 0169 | 83 | 0012 | 0075 |
| 27 | RETR1 | RAU | H0013 R | | | 0075 | 60 | 4013 | 0217 |
| 28 | | FSR | Z0013 R | | | 0217 | 23 | 4025 | 0201 |
| 29 | | FMP | A0013 R | | | 0201 | 39 | 4037 | 0137 |
| 30 | | STU | C0013 R | | | 0137 | 21 | 4124 | 0277 |
| 31 | | AXR | 0001 | | | 0277 | 52 | 0001 | 0283 |
| 32 | | NZR | RETR1 | | | 0283 | 42 | 0075 | 0187 |
| 33 | | RSR | 0012 | RETR2 | | 0187 | 83 | 0012 | 0093 |
| 34 | RETR2 | RAU | C0013 R | | | 0093 | 60 | 4124 | 0279 |
| 35 | | FSR | P0013 R | | | 0279 | 33 | 4063 | 0089 |
| 36 | | STU | T0013 R | | | 0089 | 21 | 4075 | 0278 |
| 37 | | AXR | 0001 | | | 0278 | 52 | 0001 | 0284 |
| 38 | | NZR | RETR2 | | | 0284 | 42 | 0093 | 0088 |
| 39 | | RAU | T0004 | | | 0088 | 60 | 0066 | 0171 |
| 40 | | FDV | S0002 | | | 0171 | 34 | 0038 | 0138 |
| 41 | | STU | F0002 | | F 2 | 0138 | 21 | 0101 | 0154 |
| 42 | | RAU | T0009 | | | 0154 | 60 | 0071 | 0125 |
| 43 | | FDV | S0006 | | | 0125 | 34 | 0042 | 0092 |
| 44 | | STU | F0004 | | F 4 | 0092 | 21 | 0103 | 0206 |
| 45 | | RAU | T0010 | | | 0206 | 60 | 0072 | 0377 |
| 46 | | FDV | S0009 | | | 0377 | 34 | 0045 | 0095 |
| 47 | | STU | F0006 | | | 0095 | 21 | 0105 | 0158 |
| 48 | | RAU | T0011 | | | 0158 | 60 | 0073 | 0427 |
| 49 | | FDV | S0010 | | | 0427 | 34 | 0046 | 0096 |
| 50 | | STU | F0007 | | F 7 | 0096 | 21 | 0106 | 0209 |
| 51 | | FAD | F0002 | | | 0209 | 32 | 0101 | 0477 |
| 52 | | FAD | F0004 | | | 0477 | 32 | 0103 | 0379 |
| 53 | | FAD | F0006 | | | 0379 | 32 | 0105 | 0281 |
| 54 | | STU | SUMF | | | 0281 | 21 | 0286 | 0139 |
| 55 | | RAU | F0002 | | | 0139 | 60 | 0101 | 0155 |
| 56 | | FDV | SUMF | | | 0155 | 34 | 0286 | 0386 |
| 57 | | STU | P0001 | | X 2.0 | 0386 | 21 | 0127 | 0280 |
| 58 | | RAU | F0004 | | | 0280 | 60 | 0103 | 0157 |
| 59 | | FDV | SUMF | | | 0157 | 34 | 0286 | 0436 |
| 60 | | STU | P0002 | | X 4.0 | 0436 | 21 | 0128 | 0381 |
| 61 | | RAU | F0006 | | | 0381 | 60 | 0105 | 0259 |
| 62 | | FDV | SUMF | | | 0259 | 34 | 0286 | 0486 |
| 63 | | STU | P0003 | | X 6.0 | 0486 | 21 | 0129 | 0282 |
| 64 | | RAU | F0007 | | | 0282 | 60 | 0106 | 0161 |
| 65 | | FDV | SUMF | | | 0161 | 34 | 0286 | 0536 |
| 66 | | STU | P0004 | | X 7.0 | 0536 | 21 | 0130 | 0383 |
| 67 | | RAU | P0002 | | | 0383 | 60 | 0128 | 0433 |
| 68 | | FSR | 01 | | | 0433 | 33 | 0586 | 0163 |
| 69 | | NZU | NEXT | CONT | | 0163 | 44 | 0267 | 0168 |
| 70 | NEXT | BMI | CONT | | | 0267 | 45 | 0168 | 0221 |
| 71 | | RAU | P0002 | | | 0221 | 60 | 0128 | 0482 |
| 72 | | FDV | P780H | | | 0483 | 34 | 0636 | 0686 |
| 73 | | FAD | ONE | | | 0686 | 32 | 0189 | 0165 |
| 74 | | STU | BOTT1 | | | 0165 | 21 | 0170 | 0173 |
| 75 | | RAU | P0002 | | | 0173 | 60 | 0128 | 0533 |
| 76 | | FMP | P268C | | | 0533 | 39 | 0736 | 0786 |
| 77 | | FAD | P0003 | | | 0786 | 32 | 0129 | 0205 |
| 78 | | FDV | BOTT1 | | | 0205 | 34 | 0170 | 0220 |
| 79 | | STU | P0003 | | X 6.0 | 0220 | 21 | 0129 | 0382 |
| 80 | | RAU | P0002 | | | 0382 | 60 | 0128 | 0583 |

| | | | | | | | | |
|-----|-----|-------|-------|-------|------|------|------|------|
| 81 | FMP | P119F | | 0583 | 39 | 0836 | 0886 | |
| 82 | FAD | P0003 | | 0886 | 32 | 0129 | 0255 | |
| 83 | FDV | P0111 | | 0255 | 34 | 0170 | 0270 | |
| 84 | STU | P0004 | X 7.0 | 0270 | 21 | 0130 | 0633 | |
| 85 | RAU | P0001 | | 0633 | 60 | 0127 | 0431 | |
| 86 | FDV | P0111 | | 0431 | 34 | 0170 | 0320 | |
| 87 | STU | P0001 | X 2.0 | 0320 | 21 | 0127 | 0380 | |
| 88 | RAU | ZERO | | 0380 | 60 | 0683 | 0237 | |
| 89 | STU | P0002 | CONT | X 4.0 | 0237 | 21 | 0128 | 0168 |
| 90 | RAU | 4P003 | | 0168 | 60 | 0271 | 0175 | |
| 91 | FMP | P0001 | | 0175 | 39 | 0127 | 0527 | |
| 92 | STU | TERM1 | | 0527 | 21 | 0432 | 0285 | |
| 93 | RAU | 28016 | | 0285 | 60 | 0188 | 0143 | |
| 94 | FMP | P0002 | | 0143 | 39 | 0128 | 0378 | |
| 95 | FAD | TERM1 | | 0378 | 32 | 0432 | 0309 | |
| 96 | STU | TERM1 | | 0309 | 21 | 0432 | 0385 | |
| 97 | RAU | 32P0 | | 0385 | 60 | 0238 | 0193 | |
| 98 | FMP | P0003 | | 0193 | 39 | 0129 | 0429 | |
| 99 | FAD | TERM1 | | 0429 | 32 | 0432 | 0359 | |
| 100 | STU | TERM1 | | 0359 | 21 | 0432 | 0435 | |
| 101 | RAU | 39944 | | 0435 | 60 | 0288 | 0243 | |
| 102 | FMP | P0004 | | 0243 | 39 | 0130 | 0430 | |
| 103 | FAD | TERM1 | | 0430 | 32 | 0432 | 0409 | |
| 104 | STU | N | N | 0409 | 21 | 0164 | 0317 | |
| 105 | RAU | P0001 | | 0317 | 60 | 0127 | 0481 | |
| 106 | FMP | 4P003 | | 0481 | 39 | 0271 | 0321 | |
| 107 | FDV | N | | 0321 | 34 | 0164 | 0214 | |
| 108 | STU | W0001 | | 0214 | 21 | 0177 | 0480 | |
| 109 | RAU | P0004 | | 0480 | 60 | 0130 | 0485 | |
| 110 | FMP | 39944 | | 0485 | 39 | 0288 | 0338 | |
| 111 | FDV | N | | 0338 | 34 | 0164 | 0264 | |
| 112 | STU | W0003 | | 0264 | 21 | 0179 | 0482 | |
| 113 | LDD | PETF2 | | 0482 | 69 | 0535 | 0388 | |
| 114 | STD | 1950 | | 0388 | 24 | 1950 | 0203 | |
| 115 | PCH | P0001 | | 0203 | 71 | 0127 | 0577 | |
| 116 | PCH | W0001 | 1961 | 0577 | 71 | 0177 | 1961 | |
| 117 | RSR | 0012 | RETR3 | 0535 | 83 | 0012 | 0091 | |
| 118 | RAU | H0013 | B | 0091 | 60 | 4013 | 0367 | |
| 119 | FSR | Z0013 | P | 0367 | 33 | 4025 | 0251 | |
| 120 | FMP | A0013 | P | 0251 | 39 | 4037 | 0287 | |
| 121 | STU | C0013 | R | 0287 | 21 | 4124 | 0627 | |
| 122 | AXR | 0001 | | 0627 | 52 | 0001 | 0733 | |
| 123 | NZR | RETR3 | | 0733 | 42 | 0091 | 0337 | |
| 124 | RSR | 0012 | RETR4 | 0337 | 83 | 0012 | 0293 | |
| 125 | RAU | C0013 | R | 0293 | 60 | 4124 | 0479 | |
| 126 | FSR | B0013 | P | 0479 | 33 | 4063 | 0239 | |
| 127 | STU | T0013 | R | 0239 | 21 | 4075 | 0428 | |
| 128 | AXR | 0001 | | 0428 | 52 | 0001 | 0384 | |
| 129 | NZR | RETR4 | | 0384 | 42 | 0293 | 0438 | |
| 130 | RAU | T0002 | | 0438 | 60 | 0064 | 0219 | |
| 131 | FDV | S0001 | | 0219 | 34 | 0037 | 0387 | |
| 132 | STU | F0001 | F 1 | 0387 | 21 | 0100 | 0253 | |
| 133 | RAU | T0004 | | 0253 | 60 | 0066 | 0371 | |
| 134 | FDV | S0002 | | 0371 | 34 | 0038 | 0488 | |
| 135 | STU | F0002 | F 2 | 0488 | 21 | 0101 | 0204 | |
| 136 | RAU | T0007 | | 0204 | 60 | 0069 | 0223 | |
| 137 | FDV | S0005 | | 0223 | 34 | 0041 | 0141 | |
| 138 | STU | F0003 | F 3 | 0141 | 21 | 0102 | 0305 | |

| | | | | | | | |
|-----|-----|-------|-------|------|----|------|------|
| 139 | RAU | T0010 | | 0305 | 60 | 0072 | 0677 |
| 140 | FDV | S0009 | | 0677 | 34 | 0045 | 0145 |
| 141 | STU | F0006 | F 6 | 0145 | 21 | 0105 | 0208 |
| 142 | RAU | T0011 | | 0208 | 60 | 0073 | 0727 |
| 143 | FDV | S0010 | | 0727 | 34 | 0046 | 0146 |
| 144 | STU | F0007 | F 7 | 0146 | 21 | 0106 | 0459 |
| 145 | RAU | T0012 | | 0459 | 60 | 0074 | 0529 |
| 146 | FDV | S0011 | | 0529 | 34 | 0047 | 0097 |
| 147 | STU | F0008 | F 8 | 0097 | 21 | 0107 | 0160 |
| 148 | FMP | S0008 | | 0160 | 39 | 0044 | 0094 |
| 149 | STU | E8S98 | | 0094 | 21 | 0098 | 0301 |
| 150 | RAU | T0009 | | 0301 | 60 | 0071 | 0225 |
| 151 | FSR | E8S98 | | 0225 | 33 | 0098 | 0275 |
| 152 | STU | L | | 0275 | 21 | 0530 | 0783 |
| 153 | RAU | S0006 | | 0783 | 60 | 0042 | 0147 |
| 154 | FDV | S0003 | | 0147 | 34 | 0039 | 0289 |
| 155 | STU | GOON | | 0289 | 21 | 0144 | 0197 |
| 156 | FMP | S0004 | | 0197 | 39 | 0040 | 0090 |
| 157 | STU | S6S9 | | 0090 | 21 | 0194 | 0247 |
| 158 | RAU | S0007 | | 0247 | 60 | 0043 | 0297 |
| 159 | FSR | S6S9 | | 0297 | 33 | 0194 | 0421 |
| 160 | STU | LOW1 | | 0421 | 21 | 0076 | 0579 |
| 161 | RAU | GOON | | 0579 | 60 | 0144 | 0099 |
| 162 | FMP | T0006 | | 0099 | 39 | 0068 | 0218 |
| 163 | STU | UPPER | | 0218 | 21 | 0222 | 0325 |
| 164 | RAU | L | | 0325 | 60 | 0530 | 0585 |
| 165 | FSR | UPPER | | 0585 | 33 | 0222 | 0149 |
| 166 | FDV | LOW1 | | 0149 | 34 | 0076 | 0126 |
| 167 | STU | F0005 | F 5 | 0126 | 21 | 0104 | 0207 |
| 168 | FMP | S0004 | | 0207 | 39 | 0040 | 0140 |
| 169 | STU | S6F5 | | 0140 | 21 | 0244 | 0347 |
| 170 | RAU | T0006 | | 0347 | 60 | 0068 | 0273 |
| 171 | FSR | S6F5 | | 0273 | 33 | 0244 | 0471 |
| 172 | FDV | S0003 | | 0471 | 34 | 0039 | 0339 |
| 173 | STU | F0004 | F 4 | 0339 | 21 | 0103 | 0256 |
| 174 | RAU | ZFRO | | 0256 | 60 | 0683 | 0437 |
| 175 | STU | SUMF | | 0437 | 21 | 0286 | 0389 |
| 176 | RSB | 0008 | LOOP3 | 0389 | 83 | 0008 | 0195 |
| 177 | RAU | F0009 | P | 0195 | 60 | 4108 | 0213 |
| 178 | FAD | SUMF | | 0213 | 32 | 0286 | 0263 |
| 179 | STU | SUMF | SUM F | 0263 | 21 | 0286 | 0439 |
| 180 | AXB | 0001 | | 0439 | 52 | 0001 | 0245 |
| 181 | NZR | LOOP3 | | 0245 | 42 | 0195 | 0199 |
| 182 | RSA | 0008 | LOOP4 | 0199 | 81 | 0008 | 0355 |
| 183 | RAU | F0009 | A | 0355 | 60 | 2108 | 0313 |
| 184 | FDV | SUMF | | 0313 | 34 | 0286 | 0936 |
| 185 | STU | X0009 | A | 0936 | 21 | 2085 | 0538 |
| 186 | AXA | 0001 | | 0538 | 50 | 0001 | 0294 |
| 187 | NZA | LOOP4 | | 0294 | 40 | 0355 | 0148 |
| 188 | RAU | X0001 | | 0148 | 60 | 0077 | 0531 |
| 189 | FMP | 2P016 | | 0531 | 39 | 0434 | 0484 |
| 190 | STU | SUMX | | 0484 | 21 | 0588 | 0191 |
| 191 | RAU | X0002 | | 0191 | 60 | 0078 | 0833 |
| 192 | FMP | 4P003 | | 0833 | 39 | 0271 | 0521 |
| 193 | FAD | SUMX | | 0521 | 32 | 0588 | 0215 |
| 194 | STU | SUMX | | 0215 | 21 | 0588 | 0241 |
| 195 | PAU | X0003 | | 0241 | 60 | 0079 | 0883 |
| 196 | FMP | 18016 | | 0883 | 39 | 0986 | 0487 |

| | | | | | | | |
|-----|-----|-------|-----|------|----|------|------|
| 197 | FAD | SUMX | | 0487 | 32 | 0588 | 0265 |
| 198 | STU | SUMX | | 0265 | 21 | 0588 | 0291 |
| 199 | RAU | X0004 | | 0291 | 60 | 0080 | 0635 |
| 200 | FMP | 28016 | | 0635 | 39 | 0188 | 0638 |
| 201 | FAD | SUMX | | 0638 | 32 | 0588 | 0315 |
| 202 | STU | SUMX | | 0315 | 21 | 0588 | 0341 |
| 203 | RAU | X0005 | | 0341 | 60 | 0081 | 0685 |
| 204 | FMP | 28010 | | 0685 | 39 | 0688 | 0738 |
| 205 | FAD | SUMX | | 0738 | 32 | 0588 | 0365 |
| 206 | STU | SUMX | | 0365 | 21 | 0588 | 0391 |
| 207 | RAU | X0006 | | 0391 | 60 | 0082 | 0537 |
| 208 | FMP | 32P0 | | 0537 | 39 | 0238 | 0788 |
| 209 | FAD | SUMX | | 0788 | 32 | 0588 | 0415 |
| 210 | STU | SUMX | | 0415 | 21 | 0588 | 0441 |
| 211 | RAU | X0007 | | 0441 | 60 | 0083 | 0587 |
| 212 | FMP | 39944 | | 0587 | 39 | 0288 | 0838 |
| 213 | FAD | SUMX | | 0838 | 32 | 0588 | 0465 |
| 214 | STU | SUMX | | 0465 | 21 | 0588 | 0491 |
| 215 | RAU | X0008 | | 0491 | 60 | 0084 | 0480 |
| 216 | FMP | 44010 | | 0480 | 39 | 0142 | 0192 |
| 217 | FAD | SUMX | | 0192 | 32 | 0588 | 0515 |
| 218 | STU | W0006 | N | 0515 | 21 | 0182 | 0735 |
| 219 | RAU | X0004 | | 0735 | 60 | 0080 | 0785 |
| 220 | FMP | 37099 | | 0785 | 39 | 0888 | 0938 |
| 221 | FDV | W0006 | | 0938 | 34 | 0182 | 0532 |
| 222 | STU | W0004 | A | 0532 | 21 | 0180 | 0933 |
| 223 | RAU | X0005 | | 0933 | 60 | 0081 | 0835 |
| 224 | FAD | X0008 | | 0835 | 32 | 0084 | 0211 |
| 225 | STU | X5X8 | | 0211 | 21 | 0216 | 0269 |
| 226 | RAU | X0001 | | 0269 | 60 | 0077 | 0581 |
| 227 | FAD | X0003 | | 0581 | 32 | 0079 | 0405 |
| 228 | FDV | X5X8 | | 0405 | 34 | 0216 | 0266 |
| 229 | FMP | TWO | | 0266 | 39 | 0319 | 0369 |
| 230 | STU | W0005 | D | 0369 | 21 | 0181 | 0534 |
| 231 | RAU | X0002 | | 0534 | 60 | 0078 | 0983 |
| 232 | FDV | W0006 | | 0983 | 34 | 0182 | 0582 |
| 233 | FMP | 4P003 | | 0582 | 39 | 0271 | 0571 |
| 234 | STU | J2 | W 2 | 0571 | 21 | 0176 | 0629 |
| 235 | RAU | X0007 | | 0629 | 60 | 0083 | 0637 |
| 236 | FMP | 39944 | | 0637 | 39 | 0288 | 0988 |
| 237 | FDV | W0006 | | 0988 | 34 | 0182 | 0632 |
| 238 | STU | J7 | W 7 | 0632 | 21 | 0687 | 0190 |
| 239 | RAU | W0003 | | 0190 | 60 | 0179 | 0584 |
| 240 | FDV | W0001 | | 0584 | 34 | 0177 | 0777 |
| 241 | STU | W7W2 | | 0777 | 21 | 0682 | 0885 |
| 242 | RAU | J7 | | 0885 | 60 | 0687 | 0541 |
| 243 | FDV | J2 | | 0541 | 34 | 0176 | 0226 |
| 244 | FSR | W7W2 | | 0226 | 33 | 0682 | 0509 |
| 245 | FMP | W0001 | | 0509 | 39 | 0177 | 0827 |
| 246 | FDV | 1288 | | 0827 | 34 | 0580 | 0630 |
| 247 | STU | GOON1 | | 0630 | 21 | 0634 | 0737 |
| 248 | FAD | ONE | | 0737 | 32 | 0189 | 0565 |
| 249 | FMP | S0012 | | 0565 | 39 | 0048 | 0198 |
| 250 | FAD | ONE | | 0198 | 32 | 0189 | 0615 |
| 251 | STU | DEFNR | | 0615 | 21 | 0370 | 0323 |
| 252 | RAU | GOON1 | | 0323 | 60 | 0634 | 0539 |
| 253 | FMP | S0012 | | 0539 | 39 | 0048 | 0248 |
| 254 | FDV | DEFNR | | 0248 | 34 | 0370 | 0420 |

| | | | | | | | | | |
|-----|-------|-----|-------|-------|----|------|----|------|------|
| 255 | | STU | W0007 | | R | 0420 | 21 | 0193 | 0787 |
| 256 | | RAU | X5XR | | | 0787 | 60 | 0216 | 0621 |
| 257 | | FMP | 3753 | | | 0621 | 39 | 0124 | 0174 |
| 258 | | STU | 3X5X8 | | | 0174 | 21 | 0478 | 0631 |
| 259 | | RAU | X0001 | | | 0631 | 60 | 0077 | 0681 |
| 260 | | FAD | X0003 | | | 0681 | 32 | 0079 | 0455 |
| 261 | | FMP | 63 | | | 0455 | 39 | 0258 | 0308 |
| 262 | | FAD | 3X5X8 | | | 0308 | 32 | 0478 | 0505 |
| 263 | | STU | DFNMC | | | 0505 | 21 | 0210 | 0363 |
| 264 | | RAU | X0003 | | | 0363 | 60 | 0079 | 0684 |
| 265 | | FMP | FIVE | | | 0684 | 39 | 0837 | 0887 |
| 266 | | STU | Y11 | | | 0887 | 21 | 0242 | 0295 |
| 267 | | RAU | X0005 | | | 0295 | 60 | 0081 | 0935 |
| 268 | | FMP | FIVE | | | 0935 | 39 | 0837 | 0937 |
| 269 | | FAD | Y11 | | | 0937 | 32 | 0242 | 0419 |
| 270 | | STU | Y11 | | | 0419 | 21 | 0242 | 0345 |
| 271 | | RAU | X0006 | | | 0345 | 60 | 0082 | 0987 |
| 272 | | FAD | Y11 | | | 0987 | 32 | 0242 | 0469 |
| 273 | | STU | Y11 | | | 0469 | 21 | 0242 | 0395 |
| 274 | | RAU | X0008 | | | 0395 | 60 | 0084 | 0589 |
| 275 | | FAD | Y11 | | | 0589 | 32 | 0242 | 0519 |
| 276 | | STU | Y11 | | | 0519 | 21 | 0242 | 0445 |
| 277 | | RAU | P268C | | | 0445 | 60 | 0736 | 0591 |
| 278 | | FMP | X0004 | | | 0591 | 39 | 0080 | 0680 |
| 279 | | FAD | Y11 | | | 0680 | 32 | 0242 | 0569 |
| 280 | | FDV | DFNMC | | | 0569 | 34 | 0210 | 0260 |
| 281 | | STU | W0008 | | MC | 0260 | 21 | 0184 | 0639 |
| 282 | | RAU | S0012 | | | 0639 | 60 | 0048 | 0303 |
| 283 | | STU | L0001 | | M | 0303 | 21 | 0227 | 0730 |
| 284 | | RAU | S0013 | | | 0730 | 60 | 0049 | 0353 |
| 285 | | STU | L0002 | | Y | 0353 | 21 | 0228 | 0731 |
| 286 | | RAU | S0014 | | | 0731 | 60 | 0050 | 0555 |
| 287 | | STU | L0003 | | R | 0555 | 21 | 0229 | 0732 |
| 288 | | LDD | PETF3 | | | 0732 | 69 | 0985 | 0689 |
| 289 | | STD | 1950 | | | 0689 | 24 | 1950 | 0403 |
| 290 | | PCH | X0001 | | | 0403 | 71 | 0077 | 0877 |
| 291 | | PCH | L0001 | | | 0877 | 71 | 0227 | 0927 |
| 292 | | PCH | W0001 | 1961 | | 0927 | 71 | 0177 | 1961 |
| 293 | PETF3 | RSR | 0012 | LOOPA | | 0985 | 83 | 0012 | 0641 |
| 294 | LOOPA | RAU | H0013 | R | | 0641 | 60 | 4013 | 0417 |
| 295 | | FSP | Z0013 | R | | 0417 | 33 | 4025 | 0351 |
| 296 | | FMP | A0013 | R | | 0351 | 39 | 4037 | 0739 |
| 297 | | STU | B0013 | R | | 0739 | 21 | 4063 | 0316 |
| 298 | | LDD | PETF4 | | | 0316 | 69 | 0619 | 0272 |
| 299 | | STD | 1950 | | | 0272 | 24 | 1950 | 0453 |
| 300 | | AXR | 0001 | | | 0453 | 52 | 0001 | 0559 |
| 301 | | NZR | LOOPA | 1961 | | 0559 | 42 | 0641 | 1961 |
| 302 | PETF4 | RSR | 0012 | RETR5 | | 0619 | 83 | 0012 | 0375 |
| 303 | RETR5 | RAU | H0013 | R | | 0375 | 60 | 4013 | 0467 |
| 304 | | FSP | Z0013 | R | | 0467 | 33 | 4025 | 0401 |
| 305 | | FMP | A0013 | R | | 0401 | 39 | 4037 | 0789 |
| 306 | | STU | C0013 | R | | 0789 | 21 | 4124 | 0977 |
| 307 | | AXR | 0001 | | | 0977 | 52 | 0001 | 0734 |
| 308 | | NZR | RETR5 | | | 0734 | 42 | 0375 | 0839 |
| 309 | | RAU | C0004 | | | 0839 | 60 | 0115 | 0669 |
| 310 | | FSP | B0004 | | | 0669 | 33 | 0054 | 0791 |
| 311 | | STU | T4 | | | 0791 | 21 | 0889 | 0292 |
| 312 | | RAU | C0008 | | | 0292 | 60 | 0119 | 0375 |

| | | | | | | | |
|-----|-----|-------|-------|------|----|------|------|
| 313 | FSR | P0008 | | 0373 | 33 | 0058 | 0939 |
| 314 | STU | T8 | | 0939 | 21 | 0344 | 0397 |
| 315 | RAU | C0009 | | 0397 | 60 | 0120 | 0425 |
| 316 | FSR | P0009 | | 0425 | 33 | 0059 | 0989 |
| 317 | STU | T9 | | 0989 | 21 | 0394 | 0447 |
| 318 | RAU | C0010 | | 0447 | 60 | 0121 | 0475 |
| 319 | FSR | P0010 | | 0475 | 33 | 0060 | 0240 |
| 320 | STU | T10 | | 0240 | 21 | 0444 | 0497 |
| 321 | RAU | T4 | | 0497 | 60 | 0889 | 0343 |
| 322 | FDV | S0002 | | 0343 | 34 | 0038 | 0290 |
| 323 | STU | F2 | F 2 | 0290 | 21 | 0494 | 0547 |
| 324 | RAU | T8 | | 0547 | 60 | 0344 | 0249 |
| 325 | FDV | S0006 | | 0249 | 34 | 0042 | 0342 |
| 326 | STU | F4 | F 4 | 0342 | 21 | 0196 | 0299 |
| 327 | RAU | T9 | | 0299 | 60 | 0394 | 0349 |
| 328 | FDV | S0009 | | 0349 | 34 | 0045 | 0495 |
| 329 | STU | F6 | F 6 | 0495 | 21 | 0150 | 0503 |
| 330 | RAU | T10 | | 0503 | 60 | 0444 | 0399 |
| 331 | FDV | S0010 | | 0399 | 34 | 0046 | 0246 |
| 332 | STU | F7 | F 7 | 0246 | 21 | 0200 | 0553 |
| 333 | RAU | ZERO | | 0553 | 60 | 0683 | 0340 |
| 334 | STU | SUMF | | 0340 | 21 | 0286 | 0390 |
| 335 | FAD | F2 | | 0390 | 32 | 0494 | 0671 |
| 336 | FAD | F4 | | 0671 | 32 | 0196 | 0423 |
| 337 | FAD | F6 | | 0423 | 32 | 0150 | 0528 |
| 338 | FAD | F7 | | 0528 | 32 | 0200 | 0578 |
| 339 | STU | SUMF | | 0578 | 21 | 0286 | 0440 |
| 340 | RAU | F2 | | 0440 | 60 | 0494 | 0449 |
| 341 | FDV | SUMF | | 0449 | 34 | 0286 | 0490 |
| 342 | STU | P0001 | | 0490 | 21 | 0127 | 0780 |
| 343 | RAU | F4 | | 0780 | 60 | 0196 | 0451 |
| 344 | FDV | SUMF | | 0451 | 34 | 0286 | 0540 |
| 345 | STU | P0002 | | 0540 | 21 | 0128 | 0831 |
| 346 | RAU | F6 | | 0831 | 60 | 0150 | 0605 |
| 347 | FDV | SUMF | | 0605 | 34 | 0286 | 0590 |
| 348 | STU | P0003 | | 0590 | 21 | 0129 | 0782 |
| 349 | RAU | F7 | | 0782 | 60 | 0200 | 0655 |
| 350 | FDV | SUMF | | 0655 | 34 | 0286 | 0640 |
| 351 | STU | P0004 | | 0640 | 21 | 0130 | 0784 |
| 352 | RAU | P0002 | | 0784 | 60 | 0128 | 0834 |
| 353 | FSR | 01 | | 0834 | 33 | 0586 | 0413 |
| 354 | NZU | NEXT4 | CONT3 | 0413 | 44 | 0517 | 0268 |
| 355 | RMI | CONT3 | | 0517 | 46 | 0268 | 0721 |
| 356 | RAU | P0002 | | 0721 | 60 | 0128 | 0884 |
| 357 | FDV | P7804 | | 0884 | 34 | 0636 | 0690 |
| 358 | FAD | ONE | | 0690 | 32 | 0189 | 0665 |
| 359 | STU | ROTT3 | | 0665 | 21 | 0470 | 0473 |
| 360 | RAU | P0002 | | 0473 | 60 | 0128 | 0934 |
| 361 | FMP | P268C | | 0934 | 39 | 0736 | 0740 |
| 362 | FAD | P0003 | | 0740 | 32 | 0129 | 0705 |
| 363 | FDV | ROTT3 | | 0705 | 34 | 0470 | 0520 |
| 364 | STU | P0003 | | 0520 | 21 | 0129 | 0832 |
| 365 | RAU | P119F | | 0832 | 60 | 0836 | 0691 |
| 366 | FMP | P0002 | | 0691 | 39 | 0128 | 0628 |
| 367 | FAD | P0004 | | 0628 | 32 | 0130 | 0257 |
| 368 | FDV | ROTT3 | | 0257 | 34 | 0470 | 0570 |
| 369 | STU | P0004 | | 0570 | 21 | 0130 | 0984 |
| 370 | RAU | P0001 | | 0984 | 60 | 0127 | 0881 |

NEXT4

| | | | | | | | | | |
|-----|-------|-----|-------|-------|------|------|----|------|------|
| 371 | | FDV | P0013 | | | 0891 | 34 | 0470 | 0620 |
| 372 | | STU | P0001 | | | 0620 | 21 | 0127 | 0830 |
| 373 | | RAU | ZERO | | | 0830 | 60 | 0683 | 0790 |
| 374 | | STU | P0002 | CONT3 | | 0790 | 21 | 0128 | 0268 |
| 375 | CONT3 | RAU | P0001 | | | 0268 | 60 | 0127 | 0931 |
| 376 | | FMP | 4P003 | | | 0931 | 39 | 0271 | 0771 |
| 377 | | STU | TERME | | | 0771 | 21 | 0276 | 0679 |
| 378 | | RAU | P0002 | | | 0679 | 60 | 0128 | 0840 |
| 379 | | FMP | 28016 | | | 0840 | 39 | 0188 | 0890 |
| 380 | | FAD | TERME | | | 0890 | 32 | 0276 | 0603 |
| 381 | | STU | TERME | | | 0603 | 21 | 0276 | 0729 |
| 382 | | RAU | P0003 | | | 0729 | 60 | 0129 | 0940 |
| 383 | | FMP | 32P0 | | | 0940 | 39 | 0238 | 0990 |
| 384 | | FAD | TERME | | | 0990 | 32 | 0276 | 0653 |
| 385 | | STU | TERME | | | 0653 | 21 | 0276 | 0779 |
| 386 | | RAU | P0004 | | | 0779 | 60 | 0130 | 0741 |
| 387 | | FMP | 39944 | | | 0741 | 39 | 0288 | 0791 |
| 388 | | FAD | TERME | | | 0791 | 32 | 0276 | 0703 |
| 389 | | STU | N | | N | 0703 | 21 | 0164 | 0567 |
| 390 | | RAU | P0001 | | | 0567 | 60 | 0127 | 0981 |
| 391 | | FMP | 4P003 | | | 0981 | 39 | 0271 | 0821 |
| 392 | | FDV | N | | | 0821 | 34 | 0164 | 0314 |
| 393 | | STU | W0001 | | W2.0 | 0314 | 21 | 0177 | 0880 |
| 394 | | RAU | P0004 | | | 0880 | 60 | 0130 | 0841 |
| 395 | | FMP | 39944 | | | 0841 | 39 | 0288 | 0891 |
| 396 | | FDV | N | | | 0891 | 34 | 0164 | 0364 |
| 397 | | STU | W0003 | | W7.0 | 0364 | 21 | 0179 | 0882 |
| 398 | | LDD | PETE5 | | | 0882 | 69 | 0941 | 0544 |
| 399 | | STD | 1950 | | | 0544 | 24 | 1 50 | 0752 |
| 400 | | PCH | P0001 | | | 0752 | 71 | 0127 | 0678 |
| 401 | | PCH | W0001 | 1961 | | 0678 | 71 | 0177 | 1961 |
| 402 | PETE5 | RSA | 0012 | LOOP5 | | 0941 | 81 | 0012 | 0597 |
| 403 | LOOP5 | RAU | H0013 | A | | 0597 | 60 | 2013 | 0617 |
| 404 | | FSR | Z0013 | A | | 0617 | 33 | 2025 | 0501 |
| 405 | | FMP | A0013 | A | | 0501 | 39 | 2037 | 0991 |
| 406 | | STU | C0013 | A | C | 0991 | 21 | 2124 | 0728 |
| 407 | | AXA | 0001 | | | 0728 | 50 | 0001 | 0392 |
| 408 | | NZA | LOOP5 | | | 0392 | 40 | 0597 | 0296 |
| 409 | | RSA | 0012 | LOOP6 | | 0296 | 81 | 0012 | 0152 |
| 410 | LOOP6 | RAU | C0013 | A | | 0152 | 60 | 2124 | 0829 |
| 411 | | FSR | B0013 | A | | 0829 | 33 | 2063 | 0442 |
| 412 | | STU | T0013 | A | | 0442 | 21 | 2075 | 0778 |
| 413 | | AXA | 0001 | | | 0778 | 50 | 0001 | 0492 |
| 414 | | NZA | LOOP6 | | | 0492 | 40 | 0152 | 0346 |
| 415 | | RAU | T0002 | | | 0346 | 50 | 0064 | 0719 |
| 416 | | FDV | S0001 | | | 0719 | 34 | 0037 | 0542 |
| 417 | | STU | F0001 | | F 1 | 0542 | 21 | 0100 | 0803 |
| 418 | | RAU | T0004 | | | 0803 | 60 | 0066 | 0871 |
| 419 | | FDV | S0002 | | | 0871 | 34 | 0038 | 0592 |
| 420 | | STU | F0002 | | F 2 | 0592 | 21 | 0101 | 0254 |
| 421 | | RAU | T0006 | | | 0254 | 60 | 0068 | 0523 |
| 422 | | FDV | S0005 | | | 0523 | 34 | 0041 | 0642 |
| 423 | | STU | F0003 | | F 3 | 0642 | 21 | 0102 | 0755 |
| 424 | | RAU | T0008 | | | 0755 | 60 | 0070 | 0525 |
| 425 | | FDV | S0006 | | | 0525 | 34 | 0042 | 0692 |
| 426 | | STU | F0004 | | F 4 | 0692 | 21 | 0103 | 0306 |
| 427 | | RAU | T0009 | | | 0306 | 60 | 0071 | 0575 |
| 428 | | FDV | S0009 | | | 0575 | 34 | 0045 | 0545 |

| | | | | | | | |
|-----|-----|---------|-------|------|----|------|------|
| 429 | STU | F0006 | F 6 | 0545 | 21 | 0105 | 0358 |
| 430 | RAU | T0010 | | 0358 | 60 | 0072 | 0828 |
| 431 | FDV | S0010 | | 0828 | 34 | 0046 | 0396 |
| 432 | STU | F0007 | F 7 | 0396 | 21 | 0106 | 0609 |
| 433 | RSA | 0007 | | 0609 | 81 | 0007 | 0715 |
| 434 | RAU | ZERO | | 0715 | 60 | 0683 | 0742 |
| 435 | STU | SUMF | LOOP7 | 0742 | 21 | 0286 | 0792 |
| 436 | RAU | F0008 A | | 0792 | 60 | 2107 | 0261 |
| 437 | FAD | SUMF | | 0261 | 32 | 0286 | 0463 |
| 438 | STU | SUMF | | 0463 | 21 | 0286 | 0842 |
| 439 | AXA | 0001 | | 0842 | 50 | 0001 | 0298 |
| 440 | NZA | LOOP7 | | 0298 | 40 | 0792 | 0202 |
| 441 | RAU | SUMF | | 0202 | 60 | 0286 | 1807 |
| 441 | FSR | F0005 | | 1807 | 33 | 0104 | 1800 |
| 441 | STU | SUMF | | 1800 | 21 | 0286 | 1801 |
| 441 | RSA | 0007 | LOOP9 | 1801 | 81 | 0007 | 0408 |
| 442 | RAU | F0008 A | | 0408 | 60 | 2107 | 0311 |
| 443 | FDV | SUMF | | 0311 | 34 | 0286 | 0892 |
| 444 | STU | X0008 A | | 0892 | 21 | 2084 | 0942 |
| 445 | AXA | 0001 | | 0942 | 50 | 0001 | 0348 |
| 446 | NZA | LOOP9 | | 0348 | 40 | 0408 | 0252 |
| 447 | RAU | ZERO | | 0252 | 60 | 0683 | 0992 |
| 448 | STU | SUMX | | 0992 | 21 | 0588 | 0392 |
| 449 | RAU | X0001 | | 0392 | 60 | 0077 | 0932 |
| 450 | FMP | 2P016 | | 0932 | 39 | 0434 | 0443 |
| 451 | FAD | SUMX | | 0443 | 32 | 0588 | 0765 |
| 452 | STU | SUMX | | 0765 | 21 | 0588 | 0493 |
| 453 | RAU | 4P003 | | 0493 | 60 | 0271 | 0625 |
| 454 | FMP | X0002 | | 0625 | 39 | 0078 | 0878 |
| 455 | FAD | SUMX | | 0878 | 32 | 0588 | 0815 |
| 456 | STU | SUMX | | 0815 | 21 | 0588 | 0543 |
| 457 | RAU | 18016 | | 0543 | 60 | 0985 | 0593 |
| 458 | FMP | X0003 | | 0593 | 39 | 0079 | 0879 |
| 459 | FAD | SUMX | | 0879 | 32 | 0588 | 0865 |
| 460 | STU | SUMX | | 0865 | 21 | 0588 | 0643 |
| 461 | RAU | 28016 | | 0643 | 60 | 0188 | 0693 |
| 462 | FMP | X0004 | | 0693 | 39 | 0080 | 0930 |
| 463 | FAD | SUMX | | 0930 | 32 | 0588 | 0915 |
| 464 | STU | SUMX | | 0915 | 21 | 0588 | 0743 |
| 465 | RAU | 32P0 | | 0743 | 60 | 0238 | 0793 |
| 466 | FMP | X0006 | | 0793 | 39 | 0082 | 0982 |
| 467 | FAD | SUMX | | 0982 | 32 | 0588 | 0965 |
| 468 | STU | SUMX | | 0965 | 21 | 0588 | 0843 |
| 469 | RAU | 39944 | | 0843 | 60 | 0288 | 0893 |
| 470 | FMP | X0007 | | 0893 | 39 | 0083 | 0943 |
| 471 | FAD | SUMX | | 0943 | 32 | 0588 | 0366 |
| 472 | STU | N | | 0366 | 21 | 0164 | 0667 |
| 472 | STU | W0006 | | 0667 | 21 | 0182 | 1810 |
| 473 | RAU | X0004 | | 1810 | 60 | 0080 | 0993 |
| 474 | FMP | 37099 | | 0993 | 39 | 0888 | 0594 |
| 475 | FDV | N | | 0594 | 34 | 0164 | 0414 |
| 476 | STU | W0004 | | 0414 | 21 | 0180 | 0644 |
| 477 | RAU | X0002 | | 0644 | 60 | 0078 | 0694 |
| 478 | FMP | 4P003 | | 0694 | 39 | 0271 | 0921 |
| 479 | FDV | N | | 0921 | 34 | 0164 | 0464 |
| 480 | STU | J2 | | 0464 | 21 | 0176 | 0929 |
| 481 | RAU | X0007 | | 0929 | 60 | 0083 | 0744 |
| 482 | FMP | 39944 | | 0744 | 39 | 0288 | 0794 |

| | | | | | | | | | |
|-----|-------|-----|-------|------|-----|------|----|------|------|
| 483 | | FDV | N | | | 0794 | 34 | 0164 | 0514 |
| 484 | | STU | J7 | | W 7 | 0514 | 21 | 0687 | 0844 |
| 485 | | RAU | W0003 | | | 0844 | 60 | 0179 | 0894 |
| 486 | | FDV | W0001 | | | 0894 | 34 | 0177 | 0928 |
| 487 | | STU | W7W2 | | | 0928 | 21 | 0682 | 0944 |
| 488 | | RAU | J7 | | | 0944 | 60 | 0687 | 0994 |
| 489 | | FDV | J2 | | | 0994 | 34 | 0176 | 0326 |
| 490 | | FSR | W7W2 | | | 0326 | 33 | 0682 | 0659 |
| 491 | | FMP | W0001 | | | 0659 | 39 | 0177 | 0978 |
| 492 | | FDV | 1288 | | | 0978 | 34 | 0580 | 0980 |
| 493 | | STU | ROTT4 | | | 0980 | 21 | 0595 | 0398 |
| 494 | | FAD | ONE | | | 0398 | 32 | 0189 | 0416 |
| 495 | | FMP | S0012 | | | 0416 | 39 | 0048 | 0448 |
| 496 | | FAD | ONE | | | 0448 | 32 | 0189 | 0466 |
| 497 | | STU | ROTT4 | | | 0466 | 21 | 0670 | 0573 |
| 498 | | RAU | ROTT4 | | | 0573 | 60 | 0595 | 0499 |
| 499 | | FMP | S0012 | | | 0499 | 39 | 0048 | 0498 |
| 500 | | FDV | ROTT4 | | | 0498 | 34 | 0670 | 0720 |
| 501 | | STU | W0007 | | R | 0720 | 21 | 0183 | 0645 |
| 502 | | RAU | X0001 | | | 0645 | 60 | 0077 | 0695 |
| 503 | | FAD | X0003 | | | 0695 | 22 | 0079 | 0805 |
| 504 | | STU | X1X3 | | | 0805 | 21 | 0310 | 0513 |
| 505 | | RAU | X0003 | | | 0513 | 60 | 0079 | 0745 |
| 506 | | FMP | FIVE | | | 0745 | 39 | 0837 | 0795 |
| 507 | | STU | QTM | | | 0795 | 21 | 0250 | 0853 |
| 508 | | RAU | X0006 | | | 0853 | 60 | 0082 | 0845 |
| 509 | | FAD | QTM | | | 0845 | 32 | 0250 | 0979 |
| 510 | | STU | QTM | | | 0979 | 21 | 0250 | 0903 |
| 511 | | RAU | X0004 | | | 0903 | 60 | 0080 | 0855 |
| 512 | | FMP | P268C | | | 0895 | 39 | 0736 | 0945 |
| 513 | | FAD | QTM | | | 0945 | 32 | 0250 | 0995 |
| 514 | | FMP | 15873 | | | 0995 | 39 | 0548 | 0598 |
| 515 | | FDV | X1X3 | | | 0598 | 34 | 0310 | 0360 |
| 516 | | STU | W0008 | | MC | 0360 | 21 | 0184 | 0446 |
| 517 | | RAU | S0012 | | | 0446 | 60 | 0048 | 0953 |
| 518 | | STU | L0001 | | M | 0953 | 21 | 0227 | 0496 |
| 519 | | RAU | S0013 | | | 0496 | 60 | 0049 | 0304 |
| 520 | | STU | L0002 | | Y | 0304 | 21 | 0228 | 0546 |
| 521 | | RAU | S0014 | | | 0546 | 60 | 0050 | 0855 |
| 522 | | STU | L0003 | | R | 0855 | 21 | 0229 | 0596 |
| 523 | | PCH | X0001 | | | 0596 | 71 | 0077 | 0646 |
| 524 | | PCH | L0001 | | | 0646 | 71 | 0227 | 0696 |
| 525 | | PCH | W0001 | HALT | | 0696 | 71 | 0177 | 0000 |
| 526 | 01 | 10 | 0000 | 0049 | | 0586 | 10 | 0000 | 0049 |
| 527 | ONE | 10 | 0000 | 0051 | | 0189 | 10 | 0000 | 0051 |
| 528 | ZERO | 00 | 0000 | 0000 | | 0683 | 00 | 0000 | 0000 |
| 529 | 4P003 | 40 | 0300 | 0051 | | 0271 | 40 | 0300 | 0051 |
| 530 | 28016 | 28 | 0160 | 0052 | | 0188 | 28 | 0160 | 0052 |
| 531 | 32P0 | 32 | 0000 | 0052 | | 0238 | 32 | 0000 | 0052 |
| 532 | 39944 | 39 | 9440 | 0052 | | 0288 | 39 | 9440 | 0052 |
| 533 | 18016 | 18 | 0160 | 0052 | | 0986 | 18 | 0160 | 0052 |
| 534 | 28010 | 28 | 0100 | 0052 | | 0688 | 28 | 0100 | 0052 |
| 535 | 44010 | 44 | 0100 | 0052 | | 0142 | 44 | 0100 | 0052 |
| 536 | 1288 | 12 | 8800 | 0049 | | 0580 | 12 | 8800 | 0049 |
| 537 | TWO | 20 | 0000 | 0051 | | 0319 | 20 | 0000 | 0051 |
| 538 | 3753 | 37 | 5300 | 0050 | | 0124 | 37 | 5300 | 0050 |
| 539 | 63 | 63 | 0000 | 0049 | | 0258 | 63 | 0000 | 0049 |
| 540 | FIVE | 50 | 0000 | 0050 | | 0837 | 50 | 0000 | 0050 |

| | | | | |
|-----|-------|------|------|------|
| 541 | 15873 | 15 | 8730 | 0052 |
| 542 | P268C | - 26 | 8300 | 0050 |
| | P780H | - 78 | 0800 | 0050 |
| 544 | P119F | - 11 | 9600 | 0049 |
| 545 | 2P016 | 20 | 1600 | 0051 |
| 546 | 37099 | 37 | 0990 | 0052 |

| | | | |
|------|------|------|------|
| 0548 | 15 | 8730 | 0052 |
| 0736 | - 26 | 8300 | 0050 |
| 0636 | - 78 | 0800 | 0050 |
| 0836 | - 11 | 9600 | 0049 |
| 0434 | 20 | 1600 | 0051 |
| 0888 | 37 | 0990 | 0052 |

IBM 650 7 PER CARD

| | | | | |
|-------------|-------------|-------------|-------------|---|
| 6919541953+ | 547 | 2400008000+ | 199999999+ | 2 |
| 6919531952+ | 2419611954+ | 7019621950+ | 6919561955+ | 2 |
| 6919531952+ | 2419631954+ | 3000011964+ | 6919561955+ | 2 |
| 6919531952+ | 2419651954+ | 6580021966+ | 6919561955+ | 2 |
| 6919531952+ | 2419671954+ | 8280031968+ | 6919561955+ | 2 |
| 6919531952+ | 2419691954+ | 6979501970+ | 6919561955+ | 2 |
| 6919531952+ | 2419711954+ | 5300011972+ | 6919561955+ | 2 |
| 6919531952+ | 2419731954+ | 5000011974+ | 6919561955+ | 2 |
| 17+ | 1000000052+ | 1500000052+ | 4000000051+ | 7 |
| 85+ | 1000000052+ | 5450000052+ | 3900000052+ | 1 |
| 137+ | 1000000052+ | 1000000052+ | 4000000051+ | 6 |
| 205+ | 1000000052+ | 1000000052+ | 1000000052+ | 1 |
| 257+ | 1000000051+ | 1000000051+ | 1000000051+ | 1 |
| 325+ | 1000000051+ | 3000000051+ | 1000000051+ | 1 |
| 17+ | 4000000051+ | 1500000052+ | 4000000051+ | 2 |
| 85+ | 1000000052+ | 6250000052+ | 4660000052+ | 4 |
| 137+ | 4000000051+ | 1000000052+ | 4000000051+ | 6 |
| 205+ | 1000000052+ | 1000000052+ | 1000000052+ | 1 |
| 257+ | 1000000051+ | 1000000051+ | 1000000051+ | 1 |
| 325+ | 1000000051+ | 3000000051+ | 3000000053+ | 1 |
| 377+ | 3936000052+ | 1670000052+ | 7224000051+ | 2 |
| 447+ | 7248000051+ | 7675000052+ | 1231000052+ | 1 |
| 17+ | 1000000052+ | 4850000052+ | 4000000051+ | 1 |
| 85+ | 1000000052+ | 5000000052+ | 8500000052+ | 6 |
| 137+ | 1000000052+ | 1000000052+ | 4000000051+ | 6 |
| 205+ | 1000000052+ | 1000000052+ | 1000000052+ | 1 |
| 257+ | 1000000051+ | 1000000052+ | 1000000051+ | 1 |
| 325+ | 1000000051+ | 3000000053+ | 1000000051+ | 3 |
| 17+ | 1000000052+ | 2000000052+ | 4000000051+ | 6 |
| 85+ | 6500000052+ | 1540000052+ | 1400000052+ | 2 |
| 137+ | 1000000052+ | 1000000052+ | 4000000051+ | 6 |
| 205+ | 1000000052+ | 1000000052+ | 1300000052+ | 2 |
| 257+ | 1000000051+ | 1000000051+ | 1000000051+ | 1 |
| 325+ | 1000000051+ | 1000000051+ | 1000000051+ | 1 |
| 17+ | 1000000052+ | 2000000052+ | 4000000051+ | 4 |
| 85+ | 6730000052+ | 7020000052+ | 2800000052+ | 2 |
| 137+ | 1000000052+ | 1000000052+ | 4000000051+ | 9 |
| 205+ | 1000000052+ | 1000000052+ | 1300000052+ | 2 |
| 257+ | 1000000051+ | 1000000051+ | 1000000051+ | 3 |
| 325+ | 3000000051+ | 1000000053+ | 1000000051+ | 1 |
| 377+ | 3936000052+ | 1670000052+ | 7224000051+ | 2 |
| 447+ | 7248000051+ | 7675000052+ | 1231000052+ | 1 |
| 17+ | 1000000052+ | 7610000052+ | 4000000051+ | 4 |
| 85+ | 9940000052+ | 7400000052+ | 1240000052+ | 2 |
| 137+ | 1000000052+ | 1000000052+ | 4000000051+ | 9 |
| 205+ | 1000000052+ | 1000000052+ | 1300000052+ | 2 |
| 257+ | 1000000051+ | 1000000053+ | 1000000051+ | 3 |
| 325+ | 1000000051+ | 1000000051+ | 1000000051+ | 1 |

| | | | | | | |
|----|-------------|-------------|-------------|-------------|-------------|-------------|
| 7 | 2400008000+ | 199999999+ | HALT 01 | 9999 999 | 9 | |
| 4+ | 7019621950+ | 6919561955+ | 2419628000+ | 6019511963+ | | 1 |
| 4+ | 3000011964+ | 6919561955+ | 2419648000+ | 8080021965+ | | 2 |
| 4+ | 6580021966+ | 6919561955+ | 2419668000+ | 3500011967+ | | 3 |
| 4+ | 8280031968+ | 6919561955+ | 2419688000+ | 8800021969+ | | 4 |
| 4+ | 6979501970+ | 6919561955+ | 2419708000+ | 2420001971+ | | 5 |
| 4+ | 5300011972+ | 6919561955+ | 2419728000+ | 4219731961+ | | 6 |
| 4+ | 5000011974+ | 6919561955+ | 2419741961+ | 5800011969+ | | 7 |
| 2+ | 1500000052+ | 4000000051+ | 7000000051+ | 1000000052+ | 2050000052+ | 3600000052+ |
| 2+ | 5450000052+ | 3900000052+ | 1600000052+ | 2000000052+ | | Q 0 21+ |
| 2+ | 1000000052+ | 4000000051+ | 6000000051+ | 1000000052+ | 1000000052+ | 1000000052+ |
| 2+ | 1000000052+ | 1000000052+ | 1300000052+ | 1100000052+ | | |
| 1+ | 1000000051+ | 1000000051+ | 1000000051+ | 1000000051+ | 1000000051+ | 3000000051+ |
| 1+ | 3000000051+ | 1000000051+ | 1000000051+ | 1000000051+ | | |
| 1+ | 1500000052+ | 4000000051+ | 2940000052+ | 1000000052+ | 2050000052+ | 3600000052+ |
| 2+ | 6250000052+ | 4660000052+ | 4600000052+ | 2000000052+ | | Q 1 21+ |
| 1+ | 1000000052+ | 4000000051+ | 6000000051+ | 1000000052+ | 1000000052+ | 1000000052+ |
| 2+ | 1000000052+ | 1000000052+ | 1300000052+ | 1100000052+ | | |
| 1+ | 1000000051+ | 1000000051+ | 1000000051+ | 1000000051+ | 1000000051+ | 3000000051+ |
| 1+ | 3000000051+ | 3000000053+ | 1000000051+ | 1000000051+ | | |
| 2+ | 1670000052+ | 7224000051+ | 2663000050+ | 8671000052+ | 1000000052+ | 9947000052+ |
| 1+ | 7675000052+ | 1231000053+ | 1143000053+ | 1900000051+ | 6000000052+ | 3000000051+ |
| 2+ | 4850000052+ | 4000000051+ | 1800000052+ | 1000000052+ | 7750000052+ | 5430000052+ |
| 2+ | 5000000052+ | 8500000052+ | 6460000052+ | 4810000052+ | | Q 2 21+ |
| 2+ | 1000000052+ | 4000000051+ | 6000000051+ | 1000000052+ | 1000000052+ | 1000000052+ |
| 2+ | 1000000052+ | 1000000052+ | 1000000052+ | 1000000052+ | | |
| 1+ | 1000000052+ | 1000000051+ | 1000000051+ | 1000000052+ | 1000000052+ | 1000000053+ |
| 1+ | 3000000053+ | 1000000051+ | 3000000051+ | 1000000053+ | | |
| 2+ | 2000000052+ | 4000000051+ | 6000000051+ | 1000000052+ | 3600000052+ | 1000000052+ |
| 2+ | 1540000052+ | 1400000052+ | 2000000051+ | 2000000051+ | | Q 0 22+ |
| 2+ | 1000000052+ | 4000000051+ | 6000000051+ | 1000000052+ | 1000000052+ | 1000000052+ |
| 2+ | 1000000052+ | 1300000052+ | 2000000051+ | 2000000051+ | | |
| 1+ | 1000000051+ | 1000000051+ | 1000000051+ | 1000000051+ | 3000000051+ | 1000000051+ |
| 1+ | 1000000051+ | 1000000051+ | 1000000052+ | 1000000052+ | | |
| 2+ | 2000000052+ | 4000000051+ | 4730000052+ | 1000000052+ | 3600000052+ | 1000000052+ |
| 2+ | 7020000052+ | 2800000052+ | 2000000051+ | 2000000051+ | | Q 3 22+ |
| 2+ | 1000000052+ | 4000000051+ | 9000000051+ | 1000000052+ | 1000000052+ | 1000000052+ |
| 2+ | 1000000052+ | 1300000052+ | 2000000051+ | 2000000051+ | | |
| 1+ | 1000000051+ | 1000000051+ | 3000000051+ | 1000000051+ | 3000000051+ | 1000000051+ |
| 1+ | 1000000053+ | 1000000051+ | 1000000052+ | 1000000052+ | | |
| 2+ | 1670000052+ | 7224000051+ | 2663000050+ | 8671000052+ | 1000000052+ | 9947000052+ |
| 1+ | 7675000052+ | 1231000053+ | 1143000053+ | 3500000051+ | 6000000052+ | 3000000051+ |
| 2+ | 7610000052+ | 4000000051+ | 4730000052+ | 1000000052+ | 4760000052+ | 1000000052+ |
| 2+ | 7400000052+ | 1240000052+ | 2000000051+ | 2000000051+ | | Q 4 22+ |
| 2+ | 1000000052+ | 4000000051+ | 9000000051+ | 1000000052+ | 1000000052+ | 1000000052+ |
| 2+ | 1000000052+ | 1300000052+ | 2000000051+ | 2000000051+ | | |
| 1+ | 1000000053+ | 1000000051+ | 3000000051+ | 1000000051+ | 3000000053+ | 1000000051+ |
| 1+ | 1000000051+ | 1000000051+ | 1000000052+ | 1000000052+ | | |

B

SOAP CODE CALIBRATION
 IBM 650 INPUT
 Q 1 1 1 9 CELL LOCATION
 H 1 1 1 12 0 1 TO 0012
 Z 1 1 1 12 0 13 TO 0024
 A 1 2 1 12 0 25 TO 0036
 IBM 650 OUTPUT CALIBRATION
 CELL LOCATION
 SIJ 2 1 9 1 J 8 0 77 TO 0084
 SIJ 101 12 6 J 8 0 127 TO 0129
 P9 LOWER CASE P 0130
 THIS PROGRAM USES IBM 650 7PER
 CARD LOAD SUBROUTINE
 END

| | | | | | | | | | |
|----|-------|-----|---------|-------|-------|------|----|------|------|
| 1 | | BLR | 1000 | 1999 | | | | | |
| 2 | | REG | H0001 | 0012 | READ | | | | |
| 3 | | REG | Z0013 | 0024 | READ | | | | |
| 4 | | REG | A0025 | 0036 | READ | | | | |
| 5 | | REG | B0037 | 0048 | | | | | |
| 6 | | REG | S0077 | 0084 | PUNCH | | | | |
| 7 | | REG | 10127 | 0136 | PUNCH | | | | |
| 8 | | SYN | START | 1950 | | | | | |
| 9 | | SYN | HALT | 0000 | | | | | |
| 10 | START | RSA | 0012 | RETRN | | 1950 | 81 | 0012 | 0056 |
| 11 | RETRN | RAU | H0013 A | | 2 0 | 0056 | 60 | 2013 | 0067 |
| 12 | | FSR | Z0013 A | | | 0067 | 33 | 2025 | 0051 |
| 13 | | FMP | A0013 A | | | 0051 | 39 | 2037 | 0087 |
| 14 | | STU | B0013 A | | | 0087 | 21 | 2049 | 0052 |
| 15 | | LDD | GO | | | 0052 | 69 | 0055 | 0058 |
| 16 | | STD | 1950 | | | 0058 | 24 | 1950 | 0053 |
| 17 | | AXA | 0001 | | | 0053 | 50 | 0001 | 0059 |
| 18 | | NZA | RETRN | 1961 | | 0059 | 40 | 0056 | 1961 |
| 19 | GO | RAU | H0006 | | 0 1 | 0055 | 60 | 0006 | 0061 |
| 20 | | FSR | Z0006 | | | 0061 | 33 | 0018 | 0095 |
| 21 | | FMP | A0006 | | | 0095 | 39 | 0030 | 0180 |
| 22 | | STU | C6 | | | 0180 | 21 | 0184 | 0137 |
| 23 | | RAU | H0009 | | | 0137 | 60 | 0009 | 0063 |
| 24 | | FSR | Z0009 | | | 0063 | 33 | 0021 | 0097 |
| 25 | | FMP | A0009 | | | 0097 | 39 | 0033 | 0183 |
| 26 | | STU | C9 | | | 0183 | 21 | 0088 | 0091 |
| 27 | | RAU | H0010 | | | 0091 | 60 | 0010 | 0065 |
| 28 | | FSR | Z0010 | | | 0065 | 33 | 0022 | 0049 |
| 29 | | FMP | A0010 | | | 0049 | 39 | 0034 | 0234 |
| 30 | | STU | C10 | | | 0234 | 21 | 0138 | 0141 |
| 31 | | RAU | H0011 | | | 0141 | 60 | 0011 | 0115 |
| 32 | | FSR | Z0011 | | | 0115 | 33 | 0023 | 0099 |
| 33 | | FMP | A0011 | | | 0099 | 39 | 0035 | 0085 |
| 34 | | STU | C11 | | | 0085 | 21 | 0090 | 0092 |
| 35 | | RAU | C6 | | | 0093 | 60 | 0184 | 0089 |
| 36 | | FSR | B0006 | | | 0089 | 33 | 0042 | 0069 |
| 37 | | STU | T6 | | | 0069 | 21 | 0074 | 0177 |
| 38 | | RAU | C9 | | | 0177 | 60 | 0088 | 0143 |
| 39 | | FSR | B0009 | | | 0143 | 33 | 0045 | 0071 |
| 40 | | STU | T9 | | | 0071 | 21 | 0076 | 0179 |
| 41 | | RAU | C10 | | | 0179 | 60 | 0138 | 0193 |
| 42 | | FSR | B0010 | | | 0193 | 33 | 0046 | 0073 |
| 43 | | STU | T10 | | | 0073 | 21 | 0178 | 0181 |
| 44 | | RAU | C11 | | | 0181 | 60 | 0090 | 0145 |

| | | | | | | | |
|-----|-----|-------|----------|------|----|------|------|
| 45 | FSR | R0011 | | 0145 | 33 | 0047 | 0123 |
| 46 | STU | T11 | | 0123 | 21 | 0228 | 0231 |
| 47 | RAU | T9 | | 0231 | 60 | 0076 | 0281 |
| 48 | FDV | P780H | | 0281 | 34 | 0284 | 0334 |
| 49 | FMP | MIN1 | | 0334 | 39 | 0187 | 0237 |
| 50 | STU | P9 | | 0237 | 21 | 0092 | 0195 |
| 51 | RAU | 100 | | 0195 | 60 | 0098 | 0103 |
| 52 | STU | S0006 | 5 9.4 | 0103 | 21 | 0082 | 0185 |
| 53 | RAU | T6 | | 0185 | 60 | 0074 | 0229 |
| 54 | FMP | 100 | | 0229 | 39 | 0098 | 0148 |
| 55 | FDV | T9 | | 0148 | 34 | 0076 | 0126 |
| 56 | STU | S0003 | 5 6.4 | 0126 | 21 | 0079 | 0182 |
| 57 | RAU | T10 | | 0182 | 60 | 0178 | 0233 |
| 58 | FMP | 100 | | 0233 | 39 | 0098 | 0198 |
| 59 | FDV | P268C | | 0198 | 34 | 0101 | 0151 |
| 60 | FMP | MIN1 | | 0151 | 39 | 0187 | 0287 |
| 61 | FDV | T9 | | 0287 | 34 | 0076 | 0176 |
| 62 | STU | 10001 | 10.6 | 0176 | 21 | 0127 | 0230 |
| 63 | RAU | T11 | | 0230 | 60 | 0228 | 0283 |
| 64 | FMP | 100 | | 0283 | 39 | 0098 | 0248 |
| 65 | FDV | 1196 | | 0248 | 34 | 0201 | 0251 |
| 66 | FDV | T9 | | 0251 | 34 | 0076 | 0226 |
| 67 | STU | 10002 | 11.7 | 0226 | 21 | 0128 | 0331 |
| 68 | LDD | G01 | | 0331 | 69 | 0384 | 0337 |
| 69 | STD | 1950 | 1961 | 0337 | 24 | 1950 | 1961 |
| 70 | RAU | H0006 | START Q2 | 0384 | 60 | 0006 | 0111 |
| 71 | FSR | Z0006 | | 0111 | 33 | 0018 | 0245 |
| 72 | FMP | A0006 | | 0245 | 39 | 0030 | 0280 |
| 73 | STU | C6 | | 0280 | 21 | 0184 | 0387 |
| 74 | RAU | H0009 | | 0387 | 60 | 0009 | 0113 |
| 75 | FSR | Z0009 | | 0113 | 33 | 0021 | 0147 |
| 76 | FMP | A0009 | | 0147 | 39 | 0033 | 0333 |
| 77 | STU | C9 | | 0333 | 21 | 0088 | 0191 |
| 78 | RAU | H0010 | | 0191 | 60 | 0010 | 0165 |
| 79 | FSR | Z0010 | | 0165 | 33 | 0022 | 0149 |
| 80 | FMP | A0010 | | 0149 | 39 | 0034 | 0434 |
| 81 | STU | C10 | | 0434 | 21 | 0138 | 0241 |
| 82 | RAU | C6 | | 0241 | 60 | 0184 | 0139 |
| 83 | FSR | R0006 | | 0139 | 33 | 0042 | 0119 |
| 84 | STU | T6 | | 0119 | 21 | 0074 | 0227 |
| 85 | RAU | C9 | | 0227 | 60 | 0088 | 0243 |
| 86 | FSR | R0009 | | 0243 | 33 | 0045 | 0121 |
| 87 | STU | T9 | | 0121 | 21 | 0076 | 0279 |
| 88 | RAU | C10 | | 0279 | 60 | 0138 | 0293 |
| 89 | FSR | R0010 | | 0293 | 33 | 0046 | 0173 |
| 90 | STU | T10 | | 0173 | 21 | 0178 | 0381 |
| 91 | RAU | T9 | | 0381 | 60 | 0076 | 0431 |
| 92 | FDV | S0006 | | 0431 | 34 | 0082 | 0232 |
| 93 | STU | F4 | | 0232 | 21 | 0086 | 0189 |
| 94 | RAU | T10 | | 0189 | 60 | 0178 | 0383 |
| 95 | FDV | 10001 | | 0383 | 34 | 0127 | 0277 |
| 96 | STU | F6 | | 0277 | 21 | 0282 | 0235 |
| 97 | FAD | F4 | | 0235 | 32 | 0086 | 0163 |
| 98 | STU | F4+6 | | 0163 | 21 | 0068 | 0171 |
| 99 | RAU | F6 | | 0171 | 60 | 0282 | 0437 |
| 100 | FDV | F4+6 | | 0437 | 34 | 0068 | 0118 |
| 101 | STU | X6 | X 6 | 0118 | 21 | 0072 | 0075 |
| 102 | FDV | P209F | | 0075 | 34 | 0278 | 0328 |

| | | | | | | | | |
|-----|-----|-------|-------|----------|------|----|------|------|
| 103 | FAD | ONE | | | 0328 | 32 | 0481 | 0057 |
| 104 | STU | ROT1 | | | 0057 | 21 | 0062 | 0215 |
| 105 | RAU | T10 | | | 0215 | 60 | 0178 | 0433 |
| 106 | FMP | S0006 | | | 0433 | 39 | 0082 | 0332 |
| 107 | FMP | 3P727 | | | 0332 | 39 | 0285 | 0335 |
| 108 | FDV | I0001 | | | 0335 | 34 | 0127 | 0327 |
| 109 | FAD | T9 | | | 0327 | 32 | 0076 | 0153 |
| 110 | FDV | ROT1 | | | 0153 | 34 | 0062 | 0112 |
| 111 | STU | T9 | | | 0112 | 21 | 0076 | 0329 |
| 112 | RAU | P9 | | | 0329 | 60 | 0092 | 0197 |
| 113 | FSR | T9 | | | 0197 | 33 | 0076 | 0203 |
| 114 | STU | P9T9 | | | 0203 | 21 | 0108 | 0161 |
| 115 | RAU | T9 | | | 0161 | 60 | 0076 | 0531 |
| 116 | FMP | THREE | | | 0531 | 39 | 0484 | 0534 |
| 117 | FAM | P9T9 | | | 0534 | 37 | 0108 | 0385 |
| 118 | NZU | NEXT | CONT1 | | 0385 | 44 | 0239 | 0140 |
| 119 | BMI | CONT1 | CONT2 | | 0239 | 46 | 0140 | 0343 |
| 120 | PCH | S0001 | | | 0343 | 71 | 0077 | 0377 |
| 121 | PCH | I0001 | 0000 | HALT | 0377 | 71 | 0127 | 0000 |
| 122 | RAU | T10 | | | 0140 | 60 | 0178 | 0483 |
| 123 | FMP | S0003 | | | 0483 | 39 | 0079 | 0379 |
| 124 | FMP | 3P727 | | | 0379 | 39 | 0285 | 0435 |
| 125 | FDV | I0001 | | | 0435 | 34 | 0127 | 0427 |
| 126 | FAD | T6 | | | 0427 | 32 | 0074 | 0301 |
| 127 | FDV | ROT1 | | | 0301 | 34 | 0062 | 0162 |
| 128 | STU | T6 | | | 0162 | 21 | 0074 | 0477 |
| 129 | FMP | I00 | | | 0477 | 39 | 0098 | 0298 |
| 130 | FDV | T9 | | | 0298 | 34 | 0076 | 0276 |
| 131 | STU | S0003 | | | 0276 | 21 | 0079 | 0382 |
| 132 | LDD | G02 | | | 0382 | 69 | 0485 | 0188 |
| 133 | STD | 1950 | 1961 | | 0188 | 24 | 1950 | 1961 |
| 134 | RAU | H0009 | | START Q3 | 0485 | 60 | 0009 | 0213 |
| 135 | FSR | Z0009 | | | 0213 | 33 | 0021 | 0247 |
| 136 | FMP | A0009 | | | 0247 | 39 | 0033 | 0533 |
| 137 | STU | C9 | | | 0533 | 21 | 0088 | 0291 |
| 138 | RAU | H0010 | | | 0291 | 60 | 0010 | 0265 |
| 139 | FSR | Z0010 | | | 0265 | 33 | 0022 | 0199 |
| 140 | FMP | A0010 | | | 0199 | 39 | 0034 | 0584 |
| 141 | STU | C10 | | | 0584 | 21 | 0138 | 0341 |
| 142 | RAU | C9 | | | 0341 | 60 | 0088 | 0393 |
| 143 | FSR | B0009 | | | 0393 | 33 | 0045 | 0221 |
| 144 | STU | T9 | | | 0221 | 21 | 0076 | 0429 |
| 145 | RAU | C10 | | | 0429 | 60 | 0138 | 0443 |
| 146 | FSR | B0010 | | | 0443 | 33 | 0046 | 0223 |
| 147 | STU | T10 | | | 0223 | 21 | 0178 | 0581 |
| 148 | RAU | T9 | | | 0581 | 60 | 0076 | 0631 |
| 149 | FDV | I00 | | | 0631 | 34 | 0098 | 0348 |
| 150 | STU | F4 | | | 0348 | 21 | 0086 | 0289 |
| 151 | RAU | T10 | | | 0289 | 60 | 0178 | 0583 |
| 152 | FDV | I0001 | | | 0583 | 34 | 0127 | 0527 |
| 153 | STU | F6 | | | 0527 | 21 | 0282 | 0535 |
| 154 | FAD | F4 | | | 0535 | 32 | 0086 | 0263 |
| 155 | STU | F4+6 | | | 0263 | 21 | 0068 | 0271 |
| 156 | RAU | F4 | | | 0271 | 60 | 0086 | 0391 |
| 157 | FDV | F4+6 | | | 0391 | 34 | 0068 | 0168 |
| 158 | STU | X4 | | X 4 | 0168 | 21 | 0122 | 0125 |
| 159 | FDV | P780H | | | 0125 | 34 | 0284 | 0634 |
| 160 | FAD | ONE | | | 0634 | 32 | 0481 | 0107 |

| | | | | | | | |
|-----|-----|-------|------|------|----|------|------|
| 161 | STU | ROT1 | | 0107 | 21 | 0062 | 0315 |
| 162 | RAU | T9 | | 0315 | 60 | 0076 | 0681 |
| 163 | FMP | I0001 | | 0681 | 39 | 0127 | 0577 |
| 164 | FMP | P268C | | 0577 | 39 | 0101 | 0351 |
| 165 | FDV | 100 | | 0351 | 34 | 0098 | 0398 |
| 166 | FAD | T10 | | 0398 | 32 | 0178 | 0105 |
| 167 | FDV | ROT1 | | 0105 | 34 | 0062 | 0212 |
| 168 | STU | T10 | | 0212 | 21 | 0178 | 0731 |
| 169 | FMP | 100 | | 0731 | 39 | 0098 | 0448 |
| 170 | FDV | P9 | | 0448 | 34 | 0092 | 0142 |
| 171 | STU | I0001 | | 0142 | 21 | 0127 | 0330 |
| 172 | LDD | G03 | | 0330 | 69 | 0633 | 0186 |
| 173 | STD | 1950 | 1961 | 0186 | 24 | 1950 | 1961 |
| 174 | RAU | H0009 | | 0633 | 60 | 0009 | 0313 |
| 175 | FSR | Z0009 | | 0313 | 33 | 0021 | 0297 |
| 176 | FMP | A0009 | | 0297 | 39 | 0033 | 0683 |
| 177 | STU | C9 | | 0683 | 21 | 0088 | 0441 |
| 178 | RAU | H0011 | | 0441 | 60 | 0011 | 0365 |
| 179 | FSR | Z0011 | | 0365 | 33 | 0023 | 0249 |
| 180 | FMP | A0011 | | 0249 | 39 | 0035 | 0585 |
| 181 | STU | C11 | | 0585 | 21 | 0090 | 0493 |
| 182 | RAU | C9 | | 0493 | 60 | 0088 | 0543 |
| 183 | FSR | B0009 | | 0543 | 33 | 0045 | 0321 |
| 184 | STU | T9 | | 0321 | 21 | 0076 | 0479 |
| 185 | RAU | C11 | | 0479 | 60 | 0090 | 0295 |
| 186 | FSR | B0011 | | 0295 | 33 | 0047 | 0273 |
| 187 | STU | T11 | | 0273 | 21 | 0228 | 0781 |
| 188 | RAU | T9 | | 0781 | 60 | 0076 | 0831 |
| 189 | FDV | 100 | | 0831 | 34 | 0098 | 0498 |
| 190 | STU | F4 | | 0498 | 21 | 0086 | 0339 |
| 191 | RAU | T11 | | 0339 | 60 | 0228 | 0733 |
| 192 | FDV | I0002 | | 0733 | 34 | 0128 | 0378 |
| 193 | STU | F7 | | 0378 | 21 | 0432 | 0635 |
| 194 | RAU | F4 | | 0635 | 60 | 0086 | 0491 |
| 195 | FDV | P780H | | 0491 | 34 | 0284 | 0684 |
| 196 | STU | MIDFN | | 0684 | 21 | 0238 | 0541 |
| 197 | RAU | F7 | | 0541 | 60 | 0432 | 0487 |
| 198 | FSR | MIDFN | | 0487 | 33 | 0238 | 0415 |
| 199 | STU | DEFN | | 0415 | 21 | 0070 | 0323 |
| 200 | RAU | F4 | | 0323 | 60 | 0086 | 0591 |
| 201 | FDV | DEFN | | 0591 | 34 | 0070 | 0120 |
| 202 | STU | X4 | | 0120 | 21 | 0122 | 0175 |
| 203 | RAU | T9 | | 0175 | 60 | 0076 | 0881 |
| 204 | FMP | I0002 | | 0881 | 39 | 0128 | 0428 |
| 205 | FMP | 1196 | | 0428 | 39 | 0201 | 0401 |
| 206 | FDV | 100 | | 0401 | 34 | 0098 | 0548 |
| 207 | STU | NUM | | 0548 | 21 | 0102 | 0155 |
| 208 | RAU | X4 | | 0155 | 60 | 0122 | 0627 |
| 209 | FDV | P780H | | 0627 | 34 | 0284 | 0734 |
| 210 | FAD | ONE | | 0734 | 32 | 0481 | 0157 |
| 211 | STU | ROT1 | | 0157 | 21 | 0062 | 0465 |
| 212 | RAU | T11 | | 0465 | 60 | 0228 | 0783 |
| 213 | FSR | NUM | | 0783 | 33 | 0102 | 0529 |
| 214 | FDV | ROT1 | | 0529 | 34 | 0062 | 0262 |
| 215 | STU | T11 | | 0262 | 21 | 0228 | 0931 |
| 216 | FMP | 100 | | 0931 | 39 | 0098 | 0598 |
| 217 | FDV | P9 | | 0598 | 34 | 0092 | 0192 |
| 218 | STU | I0002 | | 0192 | 21 | 0128 | 0981 |

G03

START Q4

NEG QT

POS QT

X 4

| | | | | | | | | | |
|-----|-----|-----|-------|------|----------|------|----|------|------|
| 219 | | LDD | G04 | | | 0981 | 69 | 0784 | 0537 |
| 220 | | STD | 1950 | 1961 | | 0537 | 24 | 1950 | 1961 |
| 221 | G04 | RAU | H0006 | | START 05 | 0784 | 60 | 0006 | 0211 |
| 222 | | FSR | Z0006 | | | 0211 | 33 | 0018 | 0345 |
| 223 | | FMP | A0006 | | | 0345 | 39 | 0030 | 0380 |
| 224 | | STU | C6 | | | 0380 | 21 | 0184 | 0587 |
| 225 | | RAU | H0009 | | | 0587 | 60 | 0009 | 0363 |
| 226 | | FSR | Z0009 | | | 0363 | 33 | 0021 | 0347 |
| 227 | | FMP | A0009 | | | 0347 | 39 | 0033 | 0833 |
| 228 | | STU | C9 | | | 0833 | 21 | 0088 | 0641 |
| 229 | | RAU | H0010 | | | 0641 | 60 | 0010 | 0515 |
| 230 | | FSR | Z0010 | | | 0515 | 33 | 0022 | 0299 |
| 231 | | FMP | A0010 | | | 0299 | 39 | 0034 | 0834 |
| 232 | | STU | C10 | | | 0834 | 21 | 0138 | 0691 |
| 233 | | RAU | C6 | | | 0691 | 60 | 0184 | 0389 |
| 234 | | FSR | B0006 | | | 0389 | 33 | 0042 | 0169 |
| 235 | | STU | T6 | | | 0169 | 21 | 0074 | 0677 |
| 236 | | RAU | C9 | | | 0677 | 60 | 0088 | 0593 |
| 237 | | FSR | B0009 | | | 0593 | 33 | 0045 | 0371 |
| 238 | | STU | T9 | | | 0371 | 21 | 0076 | 0579 |
| 239 | | RAU | C10 | | | 0579 | 60 | 0138 | 0643 |
| 240 | | FSR | B0010 | | | 0643 | 33 | 0046 | 0373 |
| 241 | | STU | T10 | | | 0373 | 21 | 0178 | 0482 |
| 242 | | FMP | 100 | | | 0482 | 39 | 0098 | 0648 |
| 243 | | FDV | P9 | | | 0648 | 34 | 0092 | 0242 |
| 244 | | FDV | 10001 | | | 0242 | 34 | 0127 | 0727 |
| 245 | | STU | X6 | | X6 | 0727 | 21 | 0072 | 0225 |
| 246 | | FDV | P209E | | | 0225 | 34 | 0278 | 0478 |
| 247 | | FAD | 0NF | | | 0478 | 32 | 0481 | 0207 |
| 248 | | STU | B0T1 | | | 0207 | 21 | 0062 | 0565 |
| 249 | | RAU | T10 | | | 0565 | 60 | 0178 | 0883 |
| 250 | | FMP | S0003 | | | 0883 | 39 | 0079 | 0629 |
| 251 | | FMP | 3P727 | | | 0629 | 39 | 0285 | 0685 |
| 252 | | FDV | 10001 | | | 0685 | 34 | 0127 | 0777 |
| 253 | | FAD | T6 | | | 0777 | 32 | 0074 | 0451 |
| 254 | | FDV | B0T1 | | | 0451 | 34 | 0062 | 0312 |
| 255 | | STU | T6 | | | 0312 | 21 | 0074 | 0827 |
| 256 | | RAU | T10 | | | 0827 | 60 | 0178 | 0933 |
| 257 | | FMP | 100 | | | 0933 | 39 | 0098 | 0698 |
| 258 | | FMP | 3P727 | | | 0698 | 39 | 0285 | 0735 |
| 259 | | FDV | 10001 | | | 0735 | 34 | 0127 | 0877 |
| 260 | | FAD | T9 | | | 0877 | 32 | 0076 | 0253 |
| 261 | | FDV | B0T1 | | | 0253 | 34 | 0062 | 0362 |
| 262 | | STU | T9 | | | 0362 | 21 | 0076 | 0679 |
| 263 | | RAU | T6 | | | 0679 | 60 | 0074 | 0729 |
| 264 | | FMP | 100 | | | 0729 | 39 | 0098 | 0748 |
| 265 | | FDV | P9 | | | 0748 | 34 | 0092 | 0292 |
| 266 | | STU | S0004 | | | 0292 | 21 | 0080 | 0983 |
| 267 | | RAU | T9 | | | 0983 | 60 | 0076 | 0532 |
| 268 | | FMP | 100 | | | 0532 | 39 | 0098 | 0798 |
| 269 | | FDV | P9 | | | 0798 | 34 | 0092 | 0342 |
| 270 | | STU | S0007 | | | 0342 | 21 | 0083 | 0236 |
| 271 | | LDD | G05 | | | 0236 | 69 | 0439 | 0392 |
| 272 | | STD | 1950 | 1961 | | 0392 | 24 | 1950 | 1961 |
| 273 | G05 | RAU | H0009 | | START 06 | 0439 | 60 | 0009 | 0413 |
| 274 | | FSR | Z0009 | | | 0413 | 33 | 0021 | 0397 |
| 275 | | FMP | A0009 | | | 0397 | 39 | 0033 | 0884 |
| 276 | | STU | C9 | | | 0884 | 21 | 0088 | 0741 |

| | | | | | | |
|-----|-----|-------|------|----|------|------|
| 277 | RAU | H0010 | 0741 | 60 | 0010 | 0615 |
| 278 | FSR | Z0010 | 0615 | 33 | 0022 | 0349 |
| 279 | FMP | A0010 | 0349 | 39 | 0034 | 0934 |
| 280 | STU | C10 | 0934 | 21 | 0138 | 0791 |
| 281 | RAU | H0012 | 0791 | 60 | 0012 | 0117 |
| 282 | FSR | Z0012 | 0117 | 33 | 0024 | 0501 |
| 283 | FMP | A0012 | 0501 | 39 | 0036 | 0286 |
| 284 | STU | C12 | 0286 | 21 | 0190 | 0693 |
| 285 | RAU | C9 | 0693 | 60 | 0088 | 0743 |
| 286 | FSR | R0009 | 0743 | 33 | 0045 | 0421 |
| 287 | STU | T9 | 0421 | 21 | 0076 | 0779 |
| 288 | RAU | C10 | 0779 | 60 | 0138 | 0793 |
| 289 | FSR | R0010 | 0793 | 33 | 0046 | 0423 |
| 291 | STU | T10 | 0423 | 21 | 0178 | 0582 |
| 292 | RAU | C12 | 0582 | 60 | 0190 | 0395 |
| 293 | FSR | R0012 | 0395 | 33 | 0048 | 0275 |
| 294 | STU | T12 | 0275 | 21 | 0430 | 0984 |
| 295 | RAU | T10 | 0984 | 60 | 0178 | 0785 |
| 296 | FMP | 100 | 0785 | 39 | 0098 | 0849 |
| 297 | FDV | P9 | 0849 | 34 | 0092 | 0442 |
| 298 | FDV | I0001 | 0442 | 34 | 0127 | 0927 |
| 299 | STU | X6 | 0927 | 21 | 0072 | 0325 |
| 300 | FDV | P209F | 0325 | 34 | 0278 | 0528 |
| 301 | FAD | ONE | 0528 | 32 | 0481 | 0257 |
| 302 | STU | ROT1 | 0257 | 21 | 0062 | 0665 |
| 303 | RAU | T10 | 0665 | 60 | 0178 | 0835 |
| 304 | FMP | 100 | 0835 | 39 | 0098 | 0898 |
| 305 | FMP | 3D727 | 0898 | 39 | 0285 | 0885 |
| 306 | FDV | I0001 | 0885 | 34 | 0127 | 0977 |
| 307 | FAD | T9 | 0977 | 32 | 0076 | 0303 |
| 308 | FDV | ROT1 | 0303 | 34 | 0062 | 0412 |
| 309 | STU | T9 | 0412 | 21 | 0076 | 0829 |
| 310 | RAU | T12 | 0829 | 60 | 0430 | 0935 |
| 311 | FDV | ROT1 | 0935 | 34 | 0062 | 0462 |
| 312 | STU | T12 | 0462 | 21 | 0430 | 0985 |
| 313 | RAU | T9 | 0985 | 60 | 0076 | 0632 |
| 314 | FMP | 100 | 0632 | 39 | 0098 | 0948 |
| 315 | FDV | P9 | 0948 | 34 | 0092 | 0492 |
| 316 | STU | S0008 | 0492 | 21 | 0084 | 0637 |
| 317 | RAU | T12 | 0637 | 60 | 0430 | 0336 |
| 318 | FMP | 100 | 0336 | 39 | 0098 | 0998 |
| 319 | FDV | P9 | 0998 | 34 | 0092 | 0542 |
| 320 | STU | I0003 | 0542 | 21 | 0129 | 0682 |
| 321 | LDD | G06 | 0682 | 69 | 0386 | 0489 |
| 322 | STD | 1950 | 0489 | 24 | 1950 | 1961 |
| 323 | RAU | H0002 | 0386 | 60 | 0002 | 0307 |
| 324 | FSR | Z0002 | 0307 | 33 | 0014 | 0841 |
| 325 | FMP | A0002 | 0841 | 39 | 0026 | 0326 |
| 326 | STU | C2 | 0326 | 21 | 0480 | 0436 |
| 327 | RAU | H0009 | 0436 | 60 | 0009 | 0463 |
| 328 | FSR | Z0009 | 0463 | 33 | 0021 | 0447 |
| 329 | FMP | A0009 | 0447 | 39 | 0033 | 0486 |
| 330 | STU | C9 | 0486 | 21 | 0088 | 0891 |
| 331 | RAU | C2 | 0891 | 60 | 0480 | 0536 |
| 332 | FSR | B0002 | 0536 | 33 | 0038 | 0715 |
| 333 | STU | T2 | 0715 | 21 | 0170 | 0473 |
| 334 | RAU | C9 | 0473 | 60 | 0088 | 0843 |
| 335 | FSR | R0009 | 0843 | 33 | 0045 | 0471 |

X 6

1961

START 07

G06

| | | | | | | | |
|-----|-----|-------|----------|------|----|------|------|
| 336 | STU | T9 | | 0471 | 21 | 0076 | 0879 |
| 337 | FDV | P9 | | 0879 | 34 | 0092 | 0592 |
| 338 | STU | X4 | X 4 | 0592 | 21 | 0122 | 0375 |
| 339 | FDV | P780H | | 0375 | 34 | 0284 | 0586 |
| 340 | FAD | ONE | | 0586 | 32 | 0481 | 0357 |
| 341 | STU | BOT1 | | 0357 | 21 | 0062 | 0765 |
| 342 | RAU | T2 | | 0765 | 60 | 0170 | 0425 |
| 343 | FDV | BOT1 | | 0425 | 34 | 0062 | 0512 |
| 344 | STU | T2 | | 0512 | 21 | 0170 | 0523 |
| 345 | FMP | 100 | | 0523 | 39 | 0098 | 0399 |
| 346 | FDV | P9 | | 0399 | 34 | 0092 | 0642 |
| 347 | STU | S0001 | | 0642 | 21 | 0077 | 0530 |
| 348 | LDD | G07 | | 0530 | 69 | 0636 | 0539 |
| 349 | STD | 1950 | 1961 | 0539 | 24 | 1950 | 1961 |
| 350 | RAU | H0004 | START 08 | 0636 | 60 | 0004 | 0109 |
| 351 | FSR | Z0004 | | 0109 | 33 | 0016 | 0893 |
| 352 | FMP | A0004 | | 0893 | 39 | 0028 | 0578 |
| 353 | STU | C4 | | 0578 | 21 | 0732 | 0686 |
| 354 | RAU | H0009 | | 0686 | 60 | 0009 | 0513 |
| 355 | FSR | Z0009 | | 0513 | 33 | 0021 | 0497 |
| 356 | FMP | A0009 | | 0497 | 39 | 0033 | 0736 |
| 357 | STU | C9 | | 0736 | 21 | 0088 | 0941 |
| 358 | RAU | C4 | | 0941 | 60 | 0732 | 0687 |
| 359 | FSR | B0004 | | 0687 | 33 | 0040 | 0167 |
| 360 | STU | T4 | | 0167 | 21 | 0172 | 0475 |
| 361 | RAU | C9 | | 0475 | 60 | 0088 | 0943 |
| 362 | FSR | B0009 | | 0943 | 33 | 0045 | 0521 |
| 363 | STU | T9 | | 0521 | 21 | 0076 | 0929 |
| 364 | FDV | P9 | | 0929 | 34 | 0092 | 0692 |
| 365 | STU | X4 | X 4 | 0692 | 21 | 0122 | 0525 |
| 366 | FDV | P780H | | 0525 | 34 | 0284 | 0786 |
| 367 | FAD | ONE | | 0786 | 32 | 0481 | 0407 |
| 368 | STU | BOT1 | | 0407 | 21 | 0062 | 0815 |
| 369 | RAU | T4 | | 0815 | 60 | 0172 | 0628 |
| 370 | FDV | BOT1 | | 0628 | 34 | 0062 | 0562 |
| 371 | STU | T4 | | 0562 | 21 | 0172 | 0575 |
| 372 | FMP | 100 | | 0575 | 39 | 0098 | 0449 |
| 373 | FDV | P9 | | 0449 | 34 | 0092 | 0742 |
| 374 | STU | S0002 | | 0742 | 21 | 0078 | 0782 |
| 375 | LDD | G08 | | 0782 | 69 | 0836 | 0589 |
| 376 | STD | 1950 | 1961 | 0589 | 24 | 1950 | 1961 |
| 377 | RAU | H0007 | START 09 | 0836 | 60 | 0007 | 0261 |
| 378 | FSR | Z0007 | | 0261 | 33 | 0019 | 0445 |
| 379 | FMP | A0007 | | 0445 | 39 | 0031 | 0832 |
| 380 | STU | C7 | | 0832 | 21 | 0886 | 0639 |
| 381 | RAU | H0009 | | 0639 | 60 | 0009 | 0563 |
| 382 | FSR | Z0009 | | 0563 | 33 | 0021 | 0547 |
| 383 | FMP | A0009 | | 0547 | 39 | 0033 | 0936 |
| 384 | STU | C9 | | 0936 | 21 | 0088 | 0991 |
| 385 | RAU | C7 | | 0991 | 60 | 0886 | 0792 |
| 386 | FSR | B0007 | | 0792 | 33 | 0043 | 0219 |
| 387 | STU | T7 | | 0219 | 21 | 0124 | 0678 |
| 388 | RAU | C9 | | 0678 | 60 | 0088 | 0993 |
| 389 | FSR | B0009 | | 0993 | 33 | 0045 | 0571 |
| 390 | STU | T9 | | 0571 | 21 | 0076 | 0979 |
| 391 | FDV | P9 | | 0979 | 34 | 0092 | 0842 |
| 392 | STU | X4 | X 4 | 0842 | 21 | 0122 | 0625 |
| 393 | FDV | P780H | | 0625 | 34 | 0284 | 0986 |

| | | | | | | | | |
|-----|-------|------|-------|------|------|------|------|------|
| 394 | | FAD | ONF | | 0986 | 32 | 0481 | 0457 |
| 395 | | STU | ROT1 | | 0457 | 21 | 0062 | 0865 |
| 396 | | RAU | T7 | | 0865 | 60 | 0124 | 0580 |
| 397 | | FDV | ROT1 | | 0580 | 34 | 0062 | 0612 |
| 398 | | STU | T7 | | 0612 | 21 | 0124 | 0728 |
| 399 | | FMP | 100 | | 0728 | 39 | 0098 | 0499 |
| 400 | | FDV | P0 | | 0499 | 34 | 0092 | 0892 |
| 401 | | STU | S0005 | | 0892 | 21 | 0081 | 0737 |
| 402 | | RAU | P0 | | 0737 | 60 | 0092 | 0597 |
| 403 | | STU | 10004 | | 0597 | 21 | 0130 | 0787 |
| 404 | | PCH | 10001 | | 0787 | 71 | 0127 | 0778 |
| 405 | | PCH | S0001 | HALT | 0778 | 71 | 0077 | 0000 |
| 406 | ONF | 10 | 0000 | 0051 | 0481 | 10 | 0000 | 0051 |
| 407 | 1196 | 11 | 9600 | 0049 | 0201 | 11 | 9600 | 0049 |
| 408 | 100 | 10 | 0000 | 0053 | 0098 | 10 | 0000 | 0053 |
| 409 | P780H | - 78 | 0800 | 0050 | 0284 | - 78 | 0800 | 0050 |
| 410 | P268C | - 26 | 8300 | 0050 | 0101 | - 26 | 8300 | 0050 |
| 411 | 3P727 | - 37 | 2700 | 0051 | 0285 | - 37 | 2700 | 0051 |
| 412 | P209F | - 20 | 9500 | 0050 | 0278 | - 20 | 9500 | 0050 |
| 413 | THREF | - 30 | 0000 | 0049 | 0484 | - 30 | 0000 | 0049 |
| 414 | MIN1 | - 10 | 0000 | 0051 | 0187 | - 10 | 0000 | 0051 |
| 415 | HALT | 01 | 9999 | 9999 | 0000 | 01 | 9999 | 9999 |

IRAN 650 IPEN (A) LOAD

| | | | | | |
|-------------|-------------|-------------|-------------|-------------|-------|
| 6919531952+ | 2419611954+ | 7019621950+ | 6919561955+ | 2419628000+ | 60195 |
| 6919531952+ | 2419631954+ | 3000011964+ | 6919561955+ | 2419648000+ | 80800 |
| 6919531952+ | 2419651954+ | 6580021966+ | 6919561955+ | 2419668000+ | 35000 |
| 6919531952+ | 2419671954+ | 8280031968+ | 6919561955+ | 2419688000+ | 88000 |
| 6919531952+ | 2419691954+ | 6979501970+ | 6919561955+ | 2419708000+ | 24200 |
| 6919531952+ | 2419711954+ | 5300011972+ | 6919561955+ | 2419728000+ | 42197 |
| 6919531952+ | 2419731954+ | 5000011974+ | 6919561955+ | 2419741961+ | 58000 |
| 7000000017+ | 1000000052+ | 1500000052+ | 4000000051+ | 7000000051+ | 10000 |
| 85+ | 1000000052+ | 5500000052+ | 3600000052+ | 1600000052+ | 17000 |
| 137+ | 1000000052+ | 1000000052+ | 4000000051+ | 6000000051+ | 10000 |
| 205+ | 1000000052+ | 1000000052+ | 1000000052+ | 1300000052+ | 11000 |
| 257+ | 1000000051+ | 1000000051+ | 1000000051+ | 1000000051+ | 10000 |
| 325+ | 1000000051+ | 3000000051+ | 1000000051+ | 1000000051+ | 10000 |
| 17+ | 1000000052+ | 1500000052+ | 4000000051+ | 7000000051+ | 10000 |
| 85+ | 1000000052+ | 5430000052+ | 4000000052+ | 8230000052+ | 22000 |
| 137+ | 1000000052+ | 1000000052+ | 4000000051+ | 6000000051+ | 10000 |
| 205+ | 1000000052+ | 1000000052+ | 1000000052+ | 1100000052+ | 11000 |
| 257+ | 1000000051+ | 1000000051+ | 1000000051+ | 1000000051+ | 10000 |
| 325+ | 1000000051+ | 3000000053+ | 1000000052+ | 3000000051+ | 10000 |
| 17+ | 1000000052+ | 1500000052+ | 4000000051+ | 7000000051+ | 10000 |
| 85+ | 1000000052+ | 6650000052+ | 5800000052+ | 1700000052+ | 17000 |
| 137+ | 1000000052+ | 1000000052+ | 4000000051+ | 6000000051+ | 10000 |
| 205+ | 1000000052+ | 1000000052+ | 1000000052+ | 1300000052+ | 11000 |
| 257+ | 1000000051+ | 1000000051+ | 1000000051+ | 1000000051+ | 10000 |
| 325+ | 1000000051+ | 3000000053+ | 1000000051+ | 1000000051+ | 10000 |
| 17+ | 1000000052+ | 1500000052+ | 4000000051+ | 7000000051+ | 10000 |
| 85+ | 1000000052+ | 8200000052+ | 5300000052+ | 1800000052+ | 17000 |
| 137+ | 1000000052+ | 1000000052+ | 4000000051+ | 6000000051+ | 10000 |
| 205+ | 1000000052+ | 1000000052+ | 1000000052+ | 1300000052+ | 11000 |
| 257+ | 1000000051+ | 1000000051+ | 1000000051+ | 1000000051+ | 10000 |
| 325+ | 1000000051+ | 3000000051+ | 3000000053+ | 1000000051+ | 10000 |
| 17+ | 1000000052+ | 1500000052+ | 4000000051+ | 7000000051+ | 10000 |
| 85+ | 1000000052+ | 8200000052+ | 4600000052+ | 7870000052+ | 17000 |
| 137+ | 1000000052+ | 1000000052+ | 4000000051+ | 6000000051+ | 10000 |
| 205+ | 1000000052+ | 1000000052+ | 1000000052+ | 1000000052+ | 11000 |
| 257+ | 1000000051+ | 1000000051+ | 1000000051+ | 1000000051+ | 10000 |
| 325+ | 1000000051+ | 3000000051+ | 1000000051+ | 3000000053+ | 10000 |
| 17+ | 1000000052+ | 1500000052+ | 4000000051+ | 7000000051+ | 10000 |
| 85+ | 1000000052+ | 6480000052+ | 4400000052+ | 1600000052+ | 17000 |
| 137+ | 1000000052+ | 1000000052+ | 4000000051+ | 6000000051+ | 10000 |
| 205+ | 1000000052+ | 1000000052+ | 1000000052+ | 1300000052+ | 11000 |
| 257+ | 1000000051+ | 1000000051+ | 1000000051+ | 1000000051+ | 10000 |
| 325+ | 1000000051+ | 3000000053+ | 1000000051+ | 1000000051+ | 10000 |
| 17+ | 1000000052+ | 1500000052+ | 4000000051+ | 7000000051+ | 10000 |
| 85+ | 1000000052+ | 2410000052+ | 4800000052+ | 1600000052+ | 74000 |
| 137+ | 1000000052+ | 1000000052+ | 4000000051+ | 6000000051+ | 10000 |
| 205+ | 1000000052+ | 1000000052+ | 1000000052+ | 1300000052+ | 10000 |
| 257+ | 1000000051+ | 1000000051+ | 1000000051+ | 1000000051+ | 10000 |
| 325+ | 1000000051+ | 1000000053+ | 1000000051+ | 1000000051+ | 20000 |
| 17+ | 1000000052+ | 7600000052+ | 4000000051+ | 7000000051+ | 10000 |
| 85+ | 1000000052+ | 1500000052+ | 4000000051+ | 1600000052+ | 10000 |

IBA 650 TYPE CARD LOAD

| | | | | | | |
|----|-------------|-------------|-------------|-------------|-------------|-------------|
| 4+ | 7019621950+ | 6919561955+ | 2419628000+ | 6019511962+ | | 1 |
| 4+ | 3000011964+ | 6919561955+ | 2419648000+ | 8080031965+ | | 2 |
| 4+ | 6580021966+ | 6919561955+ | 2419668000+ | 3500011967+ | | 3 |
| 4+ | 8280031968+ | 6919561955+ | 2419688000+ | 8800021969+ | | 4 |
| 4+ | 6979501970+ | 6919561955+ | 2419708000+ | 2420001971+ | | 5 |
| 4+ | 5300011972+ | 6919561955+ | 2419728000+ | 4219731961+ | | 6 |
| 4+ | 5000011974+ | 6919561955+ | 2419741961+ | 5800011969+ | | 7 |
| 2+ | 1500000052+ | 4000000051+ | 7000000051+ | 1000000052+ | 1000000052+ | 3600000052+ |
| 2+ | 5500000052+ | 3600000052+ | 1600000052+ | 1700000052+ | | CALIB Q 0 |
| 2+ | 1000000052+ | 4000000051+ | 6000000051+ | 1000000052+ | 1000000052+ | 1000000052+ |
| 2+ | 1000000052+ | 1000000052+ | 1300000052+ | 1100000052+ | | |
| 1+ | 1000000051+ | 1000000051+ | 1000000051+ | 1000000051+ | 1000000051+ | 3000000051+ |
| 1+ | 3000000051+ | 1000000051+ | 1000000051+ | 1000000051+ | | |
| 2+ | 1500000052+ | 4000000051+ | 7000000051+ | 1000000052+ | 4200000052+ | 3800000052+ |
| 2+ | 5430000052+ | 4000000052+ | 8230000052+ | 2200000052+ | | CALIB Q 1 |
| 2+ | 1000000052+ | 4000000051+ | 6000000051+ | 1000000052+ | 1000000052+ | 1000000052+ |
| 2+ | 1000000052+ | 1000000052+ | 1100000052+ | 1100000052+ | | |
| 1+ | 1000000051+ | 1000000051+ | 1000000051+ | 1000000051+ | 3000000052+ | 3000000051+ |
| 1+ | 3000000053+ | 1000000053+ | 3000000051+ | 1000000051+ | | |
| 2+ | 1500000052+ | 4000000051+ | 7000000051+ | 1000000052+ | 5100000052+ | 3600000052+ |
| 2+ | 6650000052+ | 5800000052+ | 1700000052+ | 1700000052+ | | CALIB Q 2 |
| 2+ | 1000000052+ | 4000000051+ | 6000000051+ | 1000000052+ | 1000000052+ | 1000000052+ |
| 2+ | 1000000052+ | 1000000052+ | 1300000052+ | 1100000052+ | | |
| 1+ | 1000000051+ | 1000000051+ | 1000000051+ | 1000000051+ | 3000000052+ | 3000000051+ |
| 1+ | 3000000053+ | 1000000051+ | 1000000051+ | 1000000051+ | | |
| 2+ | 1500000052+ | 4000000051+ | 7000000051+ | 1000000052+ | 2600000052+ | 3600000052+ |
| 2+ | 8200000052+ | 5300000052+ | 1800000052+ | 1700000052+ | | CALIB Q 3 |
| 2+ | 1000000052+ | 4000000051+ | 6000000051+ | 1000000052+ | 1000000052+ | 1000000052+ |
| 2+ | 1000000052+ | 1000000052+ | 1300000052+ | 1100000052+ | | |
| 1+ | 1000000051+ | 1000000051+ | 1000000051+ | 1000000051+ | 1000000051+ | 3000000051+ |
| 1+ | 3000000051+ | 3000000053+ | 1000000051+ | 1000000051+ | | |
| 2+ | 1500000052+ | 4000000051+ | 7000000051+ | 1000000052+ | 2600000052+ | 3600000052+ |
| 2+ | 8200000052+ | 4600000052+ | 7870000052+ | 1700000052+ | | CALIB Q 4 |
| 2+ | 1000000052+ | 4000000051+ | 6000000051+ | 1000000052+ | 1000000052+ | 1000000052+ |
| 2+ | 1000000052+ | 1000000052+ | 1000000052+ | 1100000052+ | | |
| 1+ | 1000000051+ | 1000000051+ | 1000000051+ | 1000000051+ | 1000000051+ | 3000000051+ |
| 1+ | 3000000051+ | 1000000051+ | 3000000053+ | 1000000051+ | | |
| 2+ | 1500000052+ | 4000000051+ | 7000000051+ | 1000000052+ | 6670000052+ | 3600000052+ |
| 2+ | 6480000052+ | 4400000052+ | 1600000052+ | 1700000052+ | | CALIB Q 5 |
| 2+ | 1000000052+ | 4000000051+ | 6000000051+ | 1000000052+ | 1000000052+ | 1000000052+ |
| 2+ | 1000000052+ | 1000000052+ | 1300000052+ | 1100000052+ | | |
| 1+ | 1000000051+ | 1000000051+ | 1000000051+ | 1000000051+ | 1000000051+ | 3000000051+ |
| 1+ | 3000000053+ | 1000000051+ | 1000000051+ | 1000000051+ | | |
| 2+ | 1500000052+ | 4000000051+ | 7000000051+ | 1000000052+ | 3000000052+ | 3600000052+ |
| 2+ | 2410000052+ | 4800000052+ | 1600000052+ | 7400000052+ | | CALIB Q 6 |
| 2+ | 1000000052+ | 4000000051+ | 6000000051+ | 1000000052+ | 1000000052+ | 1000000052+ |
| 2+ | 1000000052+ | 1000000052+ | 1300000052+ | 1000000052+ | | |
| 1+ | 1000000051+ | 1000000051+ | 1000000051+ | 1000000051+ | 1000000051+ | 3000000051+ |
| 1+ | 1000000053+ | 1000000051+ | 1000000051+ | 2000000053+ | | |
| 2+ | 7600000052+ | 4000000051+ | 7000000051+ | 1000000052+ | 2600000052+ | 3600000052+ |
| 2+ | 1500000052+ | 4000000051+ | 1600000052+ | 1000000052+ | | CALIB Q 7 |

